



SOFT FRUIT

If you are starting a new strawberry bed, high summer is the time to plant out seedlings which will begin to fruit next

year. Most of your strawberries will have been picked in early summer. Pick currants and gooseberries as they ripen.

THE GREENHOUSE

In summer the greenhouse can be left dormant, or given over to flowers.

BEEES

The summer is the time when your bees need special attention. In the early summer stop them swarming; later on take honey from them as they make it. Always see that they have enough spare combs to build on.

PLOT B

Roots

All you need to do here during the summer is hoe, watch onions for onion fly, carrots for carrot fly, and wait for things to grow. If you have space to spare, sow some more carrots, as well as rutabagas, turnips and beets.

HERB GARDEN

The summer is the time for harvesting herbs, for drying them quickly in the wind and shade, and for storing them in airtight jars when they are quite dry.

PLOT C

Potatoes

Most of this bed will be occupied with main crop potatoes. You must weed them, and spray them with Bordeaux mixture if you fear blight. The earlies will mostly have been pulled by now and their places taken by leeks.

most parts of the United States.

Don't leave any land idle in the summer. As soon as one crop comes out another ought to go in. I even like to replace a single plant when it is harvested. Out comes a cabbage, in goes a lettuce. Out comes a lettuce, in goes another one or else some radish seed. If you think of nothing else you want to grow, grow a green manure crop, preferably a leguminous one like vetch. This is nothing but beneficial, for the land and for you.

If you can't even get round to that, rejoice to see nature do it for you by letting a fine healthy crop of chickweed and other annual weeds establish themselves. Let them grow: they take up nitrates from the soil, hold them safe and prevent them from washing away. But don't let them seed. Dig them in when they are at the flowering stage, or before. They will then rot down quickly, form good humus and release their stored nutrients into the soil again. Grass clippings spread on the soil also help to nourish the soil besides keeping down weeds and holding in moisture. Idle land is not only wasting its time, it is wasting its substance; land, like people, benefits from plenty of hard work.

Now, abundance takes hold in July. Start taking out every other carrot, onion, turnip, beet and so on, so that you have fresh tender young vegetables to eat. This will give more room to the ones you leave in for winter storing. Keep picking

DEEP BED IN SUMMER

By late summer you will have pulled your broad beans. The soil should then be forked over before brassica are planted out. Fork half the deep bed from one side and the other half from the other.



peas and pick all the beans; do not let them get old and rough and stringy. Pick and pick again. To leave beans on the plant unless you want them for winter drying is wrong, because they only sap the strength of the plant and stop others growing. The more beans you pick, the more you will get.

You need to tie your tomatoes to stakes now, pinch out their side-shoots, and feed them with manure or comfrey tea (see p. 103). Celery and leeks can do with liquid manure. Celery in particular must be watered if the weather is dry; it won't grow at all in drought conditions or at best it will just bolt to seed. All *brassica* plants can do with plenty of nitrogen at this time of the year — now is the time for your top dressing of chicken manure or other organic high-nitrogen manure if your land is not naturally sufficiently fertile. Don't put any on later than July: you don't want plants to grow too lanky and sappy before the cold weather sets in.

Now is the time also to lift shallots and dry them well before storing them. Spray main crop potatoes with Bordeaux mixture (see p. 104) if you are afraid of blight. Watch like a hawk for carrot and onion fly.

Don't forget to sow onion seed during the summer so that you will have strong plants to set out next year. If you have a cold frame or a mini-greenhouse, sow a few cauliflower seeds as well. If you keep these growing on quickly you will get excellent heads in the fall. Generally, cauliflower does better in the U.S. as a fall crop rather than a spring crop.

Pinch out cucumber side-shoots. Protect plants growing under glass against the sun by white-washing the glass or setting up screens.

In August your work will be mostly weeding and harvesting. Cut cauliflower curds as they are ready; to leave them too long is only to waste them. Clear early potatoes and fill their space with leeks or green manure. Earth up celery, and earth up all *brassica* plants as you hoe them; they all benefit from earth heaped around their stems. Plants that have been harmed by cabbage root fly, or even by clubroot, will often save themselves by putting out new roots from their stems.

Complete the summer pruning of your fruit trees in August. You can still undertake the budding of fruit trees in this month if you didn't do it in July. Root strawberry runners in small peat pots for transplanting. August is a good month to establish more strawberry plants for fruiting next year, although early September is not too late.

Cut cucumbers and all the squash tribe as soon

as they are ready, even if you cannot eat them all, to keep the vines fruiting. Don't let anything go hard and bitter on the vine.

Lastly, hoe, hoe and hoe. Your success or failure as a gardener depends more than anything else on how you use, or fail to use, your hoe. Hoe weeds when they are tiny, or even before they emerge. A good hoeing does more good than a good watering. Hoe early and often and you won't have to hoe so hard.

You should consider the whole question of saving your own seed (see p.91) very carefully, because seed is becoming more and more expensive.

In September you will be harvesting the last bush, pole and lima beans. Salt down the bush and pole beans and possibly dry some, and dry your lima beans. Winter squashes and onions should be harvested when ripe and carefully stored.

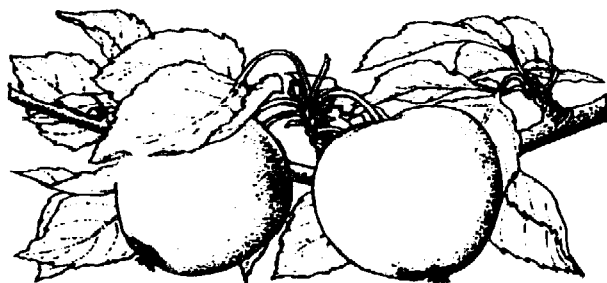
Beets, carrots, rutabagas and turnips may still have some growth left in them, so pull a few for eating fresh, but leave your main crop for storing in the ground. Celery and parsnips are not ready to lift yet, even for eating fresh, because both need a frost on them to give them flavor.

September in the fruit garden is the time to pick apples and pears. The soft fruit (apart perhaps from late strawberries and raspberries) will already have been picked.

In your greenhouse, frames, or mini-greenhouses, water less and ventilate less, but don't let things get too tender. Like human beings, plants are healthier kept slightly on the cold side. Plants protected too much will not stand up well to any winter frosts.

October brings the major job of lifting and storing the potatoes. Beets, turnips, rutabagas and carrots should also be lifted and stored now. Hill

AUTUMN



Autumn is the time of harvest. In comes crop after crop, to be eaten, preserved, or stored; your store cupboards should get filled with jars, your cellar with roots; your crocks and carboys with wines fermenting away.

As you clear bed after bed of its crop, do not neglect to sow green manure if you are not following one food crop with another, which is the best thing to do. Unfortunately leguminous plants, which make far and away the best green manure crops because they fix nitrogen, are mostly summer things and tend to die down in the winter. I find that red clover, sown early in September, makes quite a good growth before the winter kills it; I am also getting good results from winter vetches, but the seed is expensive. An advantage of vetches is that, if you keep rabbits or poultry, the crop can feed these animals before it goes back into the land as manure.



DEEP BED IN FALL

In the fall you will have some young brassica growing in place of the peas. You must hoe between these, but the leaves of the more mature brassica in the bed now cover the soil; weeds cannot grow and moisture is conserved.

The Autumn Garden

THE PERENNIAL PLOT

You will still be eating those delicious globe artichokes. Ignore all advice to cut down the asparagus ferns; leave them there to supply sap to the roots.

SEED AND HOLDING-BEDS

These can be sown with a quick-growing crop, such as lettuces, radishes, turnips or spinach. Otherwise sow green manure.

PLOT A

Miscellaneous

Your sweet corn should now be in full yield. Pick it before it gets too tough and rush it to the boiling pot. As you harvest crops from this bed, fork over the soil quickly and sow green manure seed: rye, or vetch, or both. Be patient with your outdoor tomatoes. They can ripen later than you think: I have often picked good ones in early autumn.

PLOT D

Brassica

As summer advanced you will have cleared the pea and bean crops and followed them immediately with the brassica plants from the holding-bed. These will be your winter standby and much depends on them. Do not give them nitrogen or rich manure at this stage or they will grow weak and sappy, and won't be able to stand the winter's frosts and gales.

COMPOST

Compost "makes" very quickly in the heat of the summer and by now you will have quite a lot. Get it out on to your beds and make room for more, because the time of harvest is the time when large quantities of plant wastes are available for the bins. Do not neglect to bring in what you can from outside too. If your neighbor does not want his grass mowings, collect them and compost them.

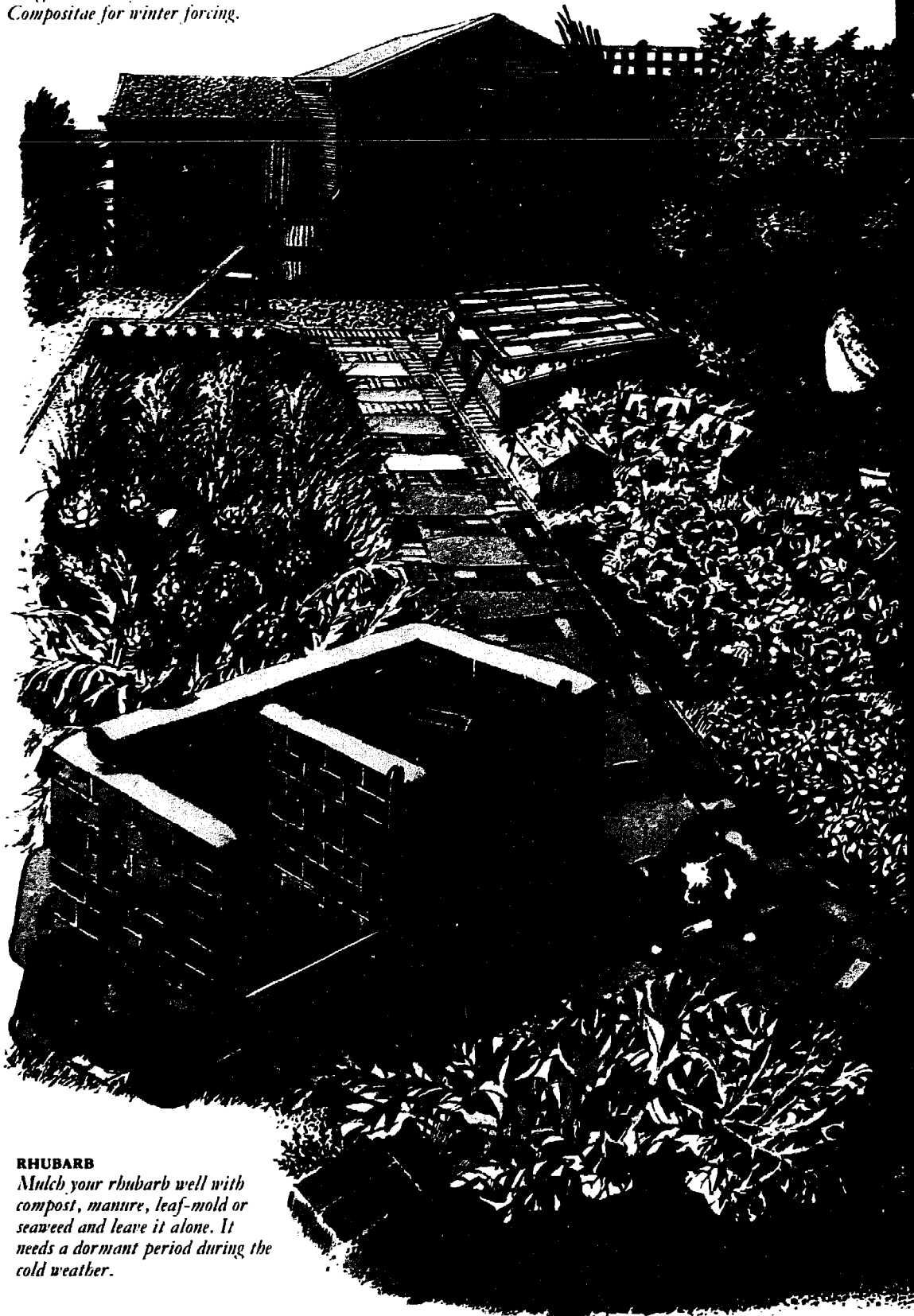
THE COLD FRAME

As you clear out the squash plants, with the eggplants and the peppers, put winter lettuces in, along with chicory and other Compositae for winter forcing.

FRUIT TREES

Now is the time to harvest the later varieties of tree fruit. Attend to hygiene: burn all fallen


branches and those fallen leaves that are diseased; put other dead leaves in the middle of the compost heap.



RHUBARB

Mulch your rhubarb well with compost, manure, leaf-mold or seaweed and leave it alone. It needs a dormant period during the cold weather.

Gardening through the Year



SOFT FRUIT

Don't be in too much of a hurry to prune your blackcurrants. Let the sap go down into the roots first. Mulch the soil heavily with organic manure.

THE GREENHOUSE

On the ground you may well plant lettuces as you harvest other crops. Clean and clear the shelves for propagation of early seedlings later on.

BEEES

You should have left the bees some honey, but the shortfall should by now be made up with sugar. Put in a blanket and wire mouse guard for the winter. In very cold climates you can wrap the hives with heavy duty black polyethylene.

PLOT B

Roots

Parsnips, carrots and rutabagas will stand up to cold weather. Beets will, too, if hilled up. All other roots must be harvested and stored in a cellar, shed, or clamp. Get green manure seed into this bed if you possibly can.

HERB GARDEN

Now is the time to harvest carefully such herb seeds as you require. Let seeds get quite ripe, pull the plants out, and hang them up in an airy place to dry. Cut off any stems that have died.

PLOT C

Potatoes

In November get the last of your main crop potatoes out of the ground. The leeks that followed the earlies will be well billed up by now. Follow the main crop with green manure: rye is probably the most practical.

up leeks and celery as required, and bend the leaves over the curds of your cauliflowers so as to protect them from the weather. Keep a vigilant eye out for slugs and snails, which love a warm wet autumn.

Harvest all tree fruit before October is out, and rake up and compost all dropped leaves under the fruit trees. This piece of hygiene helps greatly toward preventing fungous disease. If you put the leaves right into the middle of your compost heap, no harmful organisms will survive.

Seedling cauliflowers, sown in seed boxes in early October, should be pricked out into a frame. Some people sow straight into a frame ignoring the seed box stage; but I prefer to remember the "breakfast, lunch, dinner" principle - that at every transplanting, plants benefit by getting an even better meal from richer soil than they were growing in before. So I sow the seedlings in seed boxes first in ordinary seed compost, then prick them out into frames full of very rich compost with plenty of manure in it, and, come spring, I transplant them outside into a deep bed, very well manured. Be careful not to let the frames get too damp and stuffy. Open them up on all fine days and close them only at night. Remember not to

over-water in frames or greenhouses: growth and evaporation both slow down in the fall.

Once you have had a good frost, you can start pulling celery and parsnips for eating fresh. Both can be left in the ground and pulled when required until well into the winter.

November is a month you just have to put up with. The thing is not to feel defeated but to dig when you can dig, and when you can't to get out regardless and tidy up. Pull dead leaves off the *brassica* plants and put them on the compost heaps; left where they are they only harbor slugs. Cover winter crops such as celery with straw or bracken to keep the worst of the frost out, and in the same way protect such tender perennials as asparagus and globe artichokes that have died down and are dormant in the ground. Seaweed makes a marvelous mulch for this purpose.

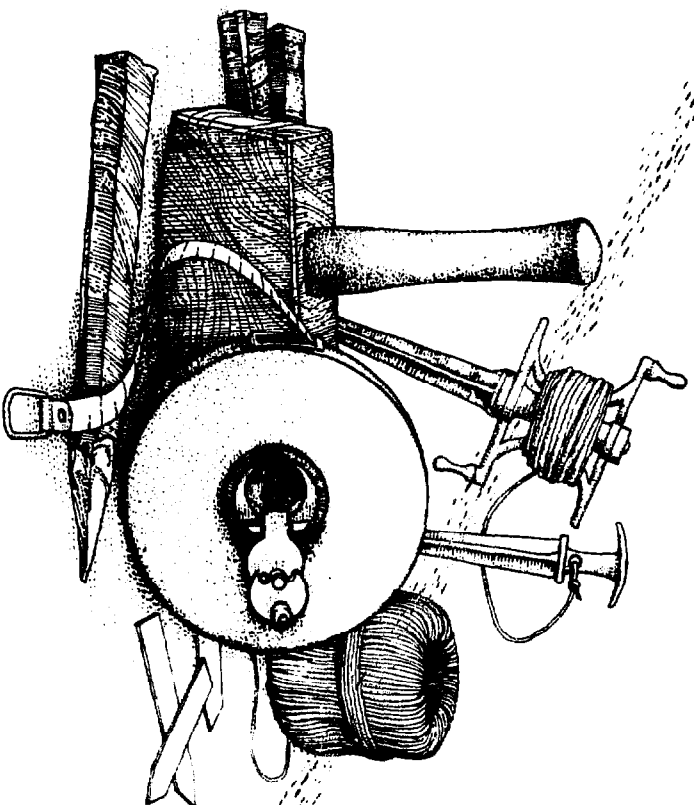
Ventilate your frames or mini-greenhouses when it is not actually freezing, but cover them with matting, old sacks, or straw when there is hard frost. Winter lettuces in the greenhouse or in frames should be kept warm, but not too humid and stuffy. Like so many plants, they must not be subjected to frost, but at the same time it is not good to baby them.

THE VEGETABLE GARDENER'S CALENDAR

	January	February	March	April	May	June	July	August	September	October	November	December
Beans broad	Sow spring seed					Harvest		Clear		Sow winter seed		
French runner				Sow under cover	Sow			Harvest				
Beetroot				Sow	Sow		Hoe			Harvest	Clamp	
Broccoli		Sow as you harvest			Plant out							
Brussels sprouts	Harvest		Sow		Plant out						Harvest	
Cabbage spring			Harvest				Sow		Plant out			
summer	Sow under cover		Sow					Harvest				
winter	Harvest			Sow		Hoe					Harvest	
Carrots				Sow		Hoe	Sow	Weed			Harvest	
Cauliflower	Sow in heat							Harvest	Sow under cover		Harvest	
Celery	Harvest		Sow under cover			Plant out	Earth up		Earth up		Harvest	
Kale	Harvest			Sow in seed-bed		Plant out			Hoe		Harvest	
Leeks	Sow as you harvest					Plant out		Hoe			Harvest	
Lettuce	Sow and harvest most of the year									Sow under glass in winter		
Marrows				Sow under cover	Sow	Hoe			Harvest			
Onions	Sow	Thin			Weed			Sow	Harvest			
Parsnips	Sow				Hoe				Harvest			
Peas			Sow			Hoe		Harvest			Sow	
Potatoes			Plant out and hoe			Harvest	Spray		Harvest			
Radishes			Sow				Sow as you harvest					
Spinach						Sow and harvest all the year						
Tomatoes			Sow under cover		Plant out	Hoe		Harvest				
Turnips/swedes				Sow			Hoe		Harvest			

CHAPTER THREE

Planning the Food-Producing Garden



*Containing the organization and laying
out of the vegetable plot, the herb
garden and the orchard, and the
principles of rotating crops.*

Planning the Food-Producing Garden

Lucky indeed is the man who can plan his garden starting with a piece of bare land. Unfortunately, most of us inherit a muddle of one sort or another — and there's no simple planning formula. You have to take into account several factors, and of course each garden, and each gardener, has different requirements. But whatever you want of your garden, my advice is always to plan now, whenever now is. Don't put off planning. The sooner you do it, the sooner you will be able to harvest your first crops.

The individual's requirements

The first principle of planning is, obviously, to consider what produce you need and want. And don't neglect your personal tastes here: it's pointless to grow a huge crop of pole beans if you don't actually like them. So, before anything else, I suggest you make a list of the crops which you'd like in your ideal garden.

In the countryside when I was a boy, farm workers needed a great bulk of easily grown food to supplement the meager diet that their low weekly wages could buy them. So they grew potatoes on at least half their gardens in the summer, and always a long row of pole beans, than which nothing is more productive. Then they grew as many *brassica* plants as they could in the winter. Many of them did not bother with much else. But if poverty isn't an urgent consideration, I think it's better not to devote all your space to the bulk crops. Instead, grow vegetables like peas and sweet corn which are best when eaten as fresh as possible. (There's a saying among sweet corn lovers that you can walk down the garden to pick the corn but you have to run back with it once it's picked.) Apart from early potatoes, rutabagas and beets, which are so delicious when young and tender, I recommend the gardener with limited space to buy his main root crops from a good market or friendly farmer, and use the space for more delicate vegetables which don't keep so well.

The true self-sufficient gardener, however, will want to be in a position where he has to buy no produce at all, and here we come to the tricky question of just how much you can expect to get from a given piece of land. Unfortunately there's no easy way of estimating this, other than by long experience and an intimate knowledge of your own garden. The best general rule in my view is to grow as much as you possibly can. If you use intensive gardening methods such as the deep bed (see p. 106) you will be amazed how many people you will be able to feed from quite a small plot.

Garden geography

Once you have got a list of the produce you want from your garden, the next thing is to ask yourself whether the general geography of the garden will let you grow it.

Aspect In my opinion, people worry too much about whether their gardens face north, south, east or west. It's true that a south-facing slope warms up quicker and better than a north-facing one. But it's also true that a south-facing slope is hit as hard by a late frost as a north-facing one. In practice, I find that north-facing crops are really not so far behind south-facing ones as many people expect. And don't underestimate the value of a north-facing slope: for example, it is often better not to force early potatoes too quickly in the early season sun on a south-facing slope because they may not have the strength to survive a freak last frost.

On the whole then, you need not be too concerned about the aspect of your garden. Remember that a good gardener will always do better in a north-facing garden than a bad gardener will in a south-facing one.

Shade What is much more important than aspect is shade. When planning your garden you must take into account how much of it will be in the shade, and for how long, during the course of the day, and the year. Certain plants just won't grow where it is too shady — just as others won't grow where there's too much direct sun. I suggest you make a rough sketch of the garden at different times of the year and color in the areas which get the sun the whole day, those which are sunny only half the day, and those which are in the shade all the time. When you have done this, you will have a clear idea of exactly how much space you will be able to devote to sun-loving and shade-loving crops respectively.

On this question of sun and shade, I've heard it said that crop rows should always run north and south rather than east and west so that the rows do not shade each other. But this is bad logic. In the northern hemisphere in the summer the sun always rises and sets to the north of the east and west points on the compass. In other words, the only time it shines directly from the south is at noon, when it is so high that shading between rows is minimal anyway. For most of the day, when it is lower and shading is important, the sun is shining from the east or the west. If anything, rows should be planted east and west to avoid too much shading. But personally I've never found it makes the slightest difference which way the rows go.

Trees There are certain features of the layout of your garden which may interfere with your planning intentions — for instance, that enormous tree in your neighbor's garden which overhangs your own garden. Not only does it shade a large part of your available growing area, but the roots creep under your land and suck out nutrients.

I'm certainly not against trees — indeed the nourishment which they take from your soil will eventually be returned when the leaves fall and begin to rot. But there are times when they really do inhibit what you can grow, and if your neighbor refuses to cut it down — as he probably will — you'll have to find some way of minimizing the inconvenience. It may be illegal to kill the tree by creosoting the roots, even if they are on your side of the fence, but it is perfectly all right to trim branches which overhang your garden and roots which burrow under it.

Sloping land If your garden slopes steeply, this can not only make gardening highly inconvenient, but can also lead to erosion of your valuable soil. The best solution here is to terrace the slope (see p. 241). Initially it's back-breaking work, but it's well worth it in the end: the garden will be far more productive, much easier to work in, the soil won't wash away, and a terraced garden can look both unusual and pleasing.

Climate

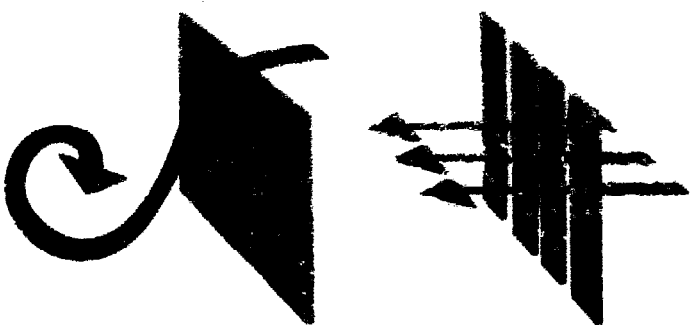
It is likely that your ideal list of the produce you want from your garden will already have been pared down by taking into account the geography of the garden. Now you'll have to pare it further by considering how many of the plants you want will grow well in your climate. While sometimes it can be fun to push your luck with plants which don't generally grow in your climate zone, for the most part it's hopeless trying to compete against the climate — better to use it as an ally.

Frost The trouble is, of course, that it's not easy to predict with any certainty what the weather will be like from season to season — or even, as most of us know from long experience of weather reports, from day to day. The most experienced gardener can be caught out by a sudden hard frost in the middle of spring. Still, I suggest you try to work out roughly how long a growing season you can expect in your area: say from the last frost of the spring to the first frost of the late fall. (For climate maps see p. 248.) It's always a good idea to make friends with a gardener who knows the district really well, and to ask him how long he expects the growing season to be.

Unless you decide to go in for extensive protection of your plants with greenhouses, mini-greenhouses, cloches and so on there's not much you can do to extend the growing season. But you may be able to take measures against other climatic factors.

Wind Something you should include in your shade/sun chart of the garden is the direction of the prevailing wind, and a indication of which parts of the garden are sheltered or exposed. While some plants tolerate wind — though you might need to stake them — there are others such as most fruit crops, Pinus, and the taller brassica which won't.

If the garden is particularly exposed to wind the obvious thing is to build a wind-break or wind break. A fence with gaps in it is a much more efficient wind-break than a solid one. A solid wall creates swirling eddies in the wind which do as much damage as unrestrained wind.



SOLID WOODEN FENCE

Wind swirls over a solid wooden fence, forming potentially harmful eddies.

GAPPED FENCE

Wind passes through a wooden fence with gaps, but with its force directed downwards.

If a fence is impractical, plant a hedge (see p. 243) bushes or a line of trees — whatever will allow some wind through. Obviously you'll have to give up some growing space for this, but it's quite possible that the increase in crops because of the shelter will make up the loss.

Water In most climates it's necessary to have a water source near your seed-bed to help the seeds establish roots. Once the roots are firm, regular watering is not so vital, except in very dry climates or during a drought. In these cases, I recommend laying water-lines. It's not a difficult job nowadays since plastic pipe is easily available. Just lead the pipe from wherever your water source happens to be. If there's a chance of hard frost, bury the pipes underground — though normally plastic pipes don't burst as readily as metal ones. In fact, I think it's a good idea to bury the pipes anyway to keep them out of the way. And plastic can be affected by strong sunlight.

Soil conditions

One final, but very important matter you need to take into account when planning your garden is the nature of the soil. You may find that many of the plants you're thinking of growing need soil which is, for example, more or less acid, than the soil you have in your plot. Fortunately, it's not difficult to correct the nature of your soil (soil tests and treatments are discussed on pp. 80-90). But I strongly advise you to get your soil balance right before you actually start planting. You can – and should – give your soil regular treatment even when it is occupied, but of course it's much easier to dig in, say, compost or manure when the land is bare than to wait for a time when it's covered by a crop.

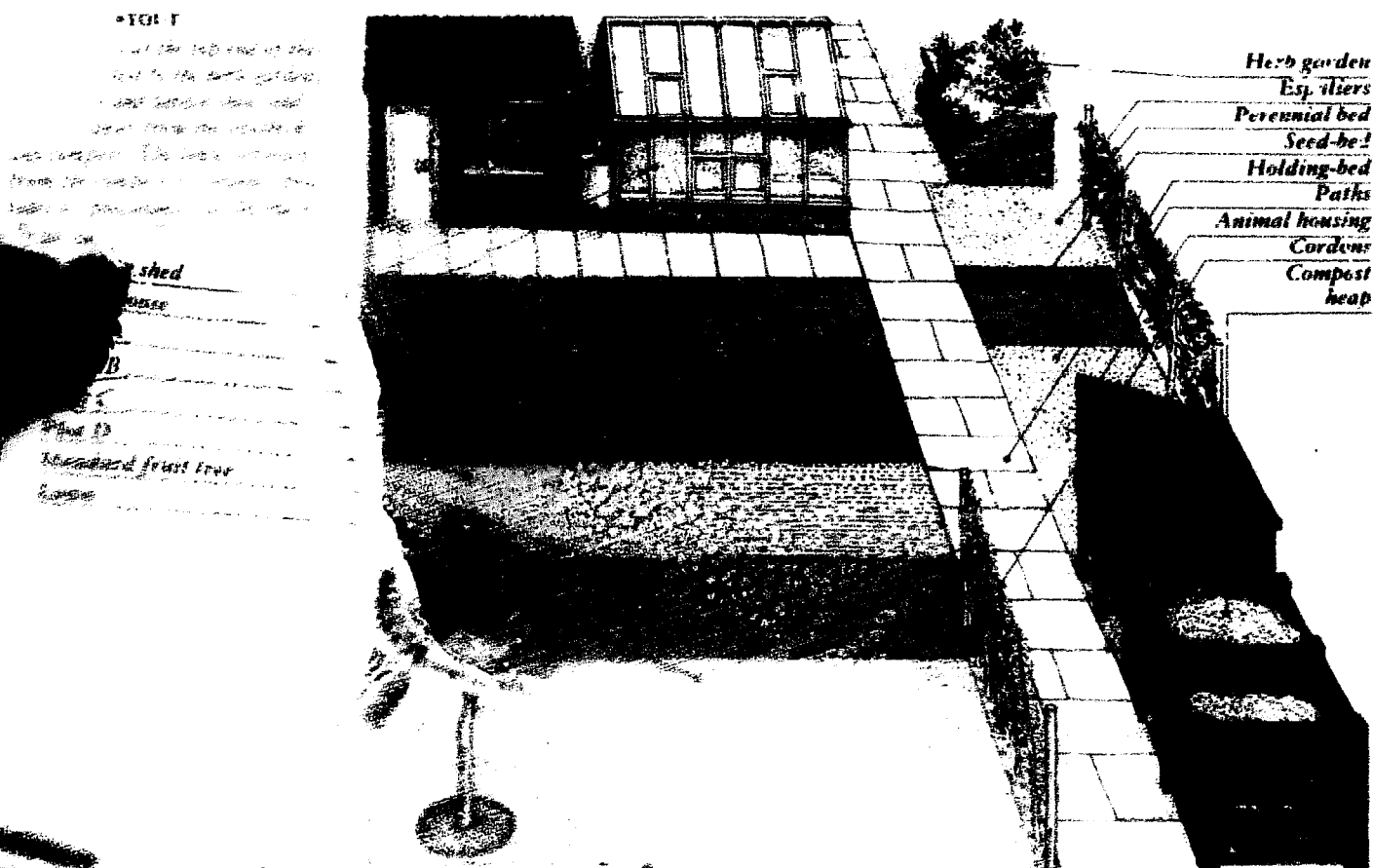
Positioning the different elements

After considering the various factors which will influence your first list of the produce you would ideally like in your garden, you should now have a clear idea of what you can and what you can't grow. The next question, of course, is whether you have the space in your plot for the various elements. To estimate this, you'll need to take into account the basic elements which every garden

should include. In my view, the best basic garden site should be worked around the following elements: a seed-bed, a holding bed, a herb garden; a bed for perennials; a bed for perennial soft fruit; four beds for annual vegetables; and either an orchard or a smaller area to accommodate fruit trees. Garden constructions should include compost bins, a place to house animals, a garden shed, and, if you want one, a greenhouse. These form your basic working areas, but I think you should also allow for both a lawn and a small flower bed. You'll be grateful for a lawn where you can lounge in the sun when you've done the weeding, and it refreshes your senses – and your soul – to have a small plot containing some of those delightful old-fashioned cottage garden flowers.

The shape of your garden will obviously determine where you can put what. But there are a few siting rules which I think are worth noting. It saves both labor and frustration if you don't continually have to walk the length of the garden to perform one simple garden task.

Seed-bed The most important consideration in siting the seed-bed in my opinion is to have it close to a water source. Ideally, put it next to a faucet. If that is just not possible, then lay



permanent water-lines (preferably buried out of the way) to the seed-bed.

Holding-bed Since you will be transferring seedlings to the holding-bed from the seed-bed, try to have them adjacent – perhaps separated by a narrow path.

Herb garden There's nothing worse when you're in the middle of cooking than to have to run to the end of the garden in a downpour in order to pick a handful of herbs. So put the herb garden as close as you can to the kitchen door.

Compost bins Obviously it's best to have the compost bins near to the growing beds to save you maneuvering barrows of compost up and down the garden. But there's a more important consideration here. If you keep livestock, then it's so much easier to be able to clean out the houses and dump the manure straight on to the compost heap. And since you won't want the animals too near to your own living quarters, I think the compost bins should be next to the livestock at the end of the garden.

Bee hives You'll no doubt want to avoid getting stung by bees if you keep them, so it's not a good idea to put your bee hives with the other animal houses. Besides, bees like the sun, and they don't like being under dripping trees. So I suggest you site them somewhere high up – on a roof or a specially built platform. This will definitely save you getting stung because the flight path of bees living high up is not going to be obstructed by a perspiring gardener.

Greenhouse and garden shed I would advise keeping both the greenhouse and the garden shed near to the house. In fact, the ideal in a small garden is to have a lean-to greenhouse against the house wall since this saves space. If a greenhouse is too far away from the house, you may have a problem with your electricity supply for lighting and heating. If you want to use your garden shed for potting as well as keeping tools, consider putting it adjacent to the greenhouse – perhaps even interconnecting with the greenhouse.

THE SIZE OF THE GARDEN

Since there is no such thing as a standard-size garden, it's probably best to consider a basic garden plan and think of it as coming in three models: small, inedium and large. Once you have worked out which vegetables you require, whether you have the conditions in which to grow the crops, and where you are going to site the various garden constructions, you must still accommodate everything in the available space.

The small garden

"Small is beautiful" is Dr Schumacher's famous phrase, and a small garden can be quite as beautiful – and, if it's intensively cultivated, almost as productive – as a large one. In fact, it's often much easier to practice intensive gardening methods in a small garden: for example, a sackful of leaf-mold gathered in a nearby park or forest will make a significant difference to the fertility of a small garden, while you would need a lot more for it to be effective in a large one.

However, in a small garden you must learn to make use of every possible bit of growing space – and there are many more possibilities than you might think. In the first place, consider the third dimension of the garden: in a large garden there's no problem about spreading out horizontally, but in a small one it's an excellent alternative to garden vertically.

Vertical gardening Garden fences, fence posts, walls – even the walls of your house – all provide vertical growing space. Peas, the climbing beans, tomatoes, cucumbers and many of the squash tribe can all be trained upward with a system of ties and wires. Never let vertical space remain idle in the summer. And don't forget you can grow down from a height by using hanging tubs.

USING SPACE IMAGINATIVELY

A hanging basket full of zucchini is making effective use of vertical space. Standing a bay tree in a tub on a plank on castors means it can be wheeled indoors.

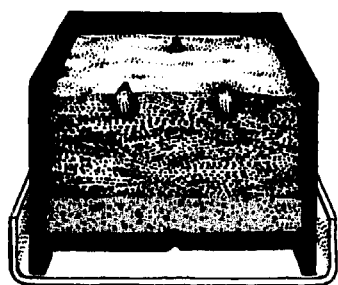


Window box gardening Remember that window ledges give you another horizontal plane for gardening, and it's very simple to construct suitable containers. It seems to me a pity always to put geraniums in window boxes: geraniums are nice, but tomatoes and lettuces are nicer to a hungry man, and they'll both grow successfully in window boxes.

Roof and patio gardening A roof or a patio, if you have one, provides useful space for tubs and similar containers, or for grow bags filled with

peat or other mixtures. (But remember to allow for the weight of the containers and the soil, if you contemplate using, say, an old outhouse roof which may not be very strong.) Broad beans, pole beans, broccoli, Brussels sprouts, cabbage, lettuce and cucumbers will all grow well on a roof or patio; and if the climate is hot, so will peppers. Bay trees and lemon or orange trees planted in tubs which can be moved indoors in cold weather are also a good idea.

Indoor gardening Nearly all vegetables and small fruits can be grown indoors, and, especially if you have a small garden, you should think of every window sill, except those which face north, as an extension of your garden. Window sills can be used to grow herbs, tomatoes, lettuces, carrots, radishes and spring onions, and almost any kind of container will do. Just punch holes in the bottom for drainage, and place it on a waterproof tray to catch seepage. Put three inches (8 cm) of gravel at the bottom of the container and fill it up with equal volumes of potting compost, garden compost and good garden soil.



WINDOW SILL GARDENING

This cross-section through a window box shows shallots growing in equal parts of potting compost, garden compost and garden soil. Three inches (8 cm) of gravel help drainage through small holes in the box, which stands on a waterproof tray.

When all your window sills are occupied, consider other parts of the house too. Mushrooms, for example, grow very well under the stairs, in a basement or cellar – even in the bottom of an old wardrobe. For this, it's best to use special mushroom compost (see p. 166), which you can either buy or make yourself.

Recently it's become quite common to garden under artificial lighting, and of course this can be arranged virtually anywhere in the house. Fluorescent tubes are best – a combination of two four foot (1.2 m) tubes of forty watts each, one cool white and the other warm white. (Avoid using standard white or "daylight" tubes.) You can grow a number of plants successfully under lights: beets, carrots, lettuce, celery, cucumber, tomatoes, herbs, and mustard and cress. My only reservation about the system is that, given the current high price of energy, it isn't very cost-effective. But the investment is well worth it if you really haven't got any garden or outdoor growing space at all.

The medium-sized garden

A medium-sized garden – I'm thinking of something like the larger type of city garden or one of the bigger suburban gardens – allows the gardener greater freedom. But don't indulge the freedom too much. My advice is always to start small and intensively, and only gradually take in more and more land as you get the feel of the garden. Don't, for example, dig up the whole plot at the outset because you'll never cope without working it full time.

Even though there's more growing space, it shouldn't be wasted – for instance, by allowing an old, straggling and unproductive apple or pear tree to dominate. Cut such trees down (apple and pear trees make excellent firewood). It's a much better use of space to arrange that a fence or two are covered with cordon or espalier apple and pear trees (see p. 101), which in fact often bear a heavier crop than an old, neglected, standard tree.

The medium-sized garden will probably also accommodate a modest greenhouse, and that can be worth its weight in – well, tomatoes anyway. You'll be able to start plants off early in the season, and may manage to avoid the dreaded hungry gap in the spring. Cold frames will also extend the growing season, and if you have the space you can look on them as fairly permanent. I think it's a good idea to have them adjacent to the greenhouse, so you can harden off the greenhouse seedlings conveniently.

A particular advantage of the medium-sized garden is that you can pay more attention to decorative and non-productive areas – the "pleasure" where you can idle away a few hours in the sun. I must say I think the conventional ideas about siting it are mistaken: usually it's put next to the house because people think it nicer to look out on flowers and a lawn rather than on the vegetable beds. But consider the view when you're actually out there – the back of the house, which is often pretty ugly anyway, with all the gutters and drains. I would have a lawn right at the end of the garden, screened from the vegetables by, say, an espalier fence, and with a few flower beds for fragrance, and perhaps some small fruit trees. Keep your tame rabbits here, and with all the birds twittering around you, you'll have a real haven as far as possible from buildings – your own, and those of prying neighbors too. Remember, incidentally that a lawn is not only a leisure area – it is a consistent source of good mulching material. If you don't use your clippings as mulch, put them on the compost heap.

The large garden

No matter how much space you have in your garden, remember once again to start small. Master small areas first, and then you'll have the experience to work on a larger scale.

But even if you don't use the whole of your plot at the same time, you can still make it all work for you without expending much effort. Nothing improves the general heart of your land more than to lay it to pasture and graze stock on it for three or four years. At the end of this period, convert the pasture, bit by bit, into beds which can be taken up into your crop rotation. Grass and clover pastures are fine, but I suggest planting the deep-rooting crops like alfalfa or comfrey. These all mine up useful minerals from the depths of the subsoil, and whether you dig them in as green manure, put them on the compost heap, or merely feed them to the poultry, the minerals will eventually be spread about your garden. This method of resting the land will also ensure that any residual disease which remains in the soil from previous crops won't give you trouble when you come to plant vegetables.

With a large garden, you can consider planting standard fruit trees instead of the dwarf varieties or cordon and espalier-trained trees which are space-savers in smaller gardens. The modern dwarfing root stocks probably will give you a higher yield of fruit more quickly than a standard tree will, but at the same time few things look more beautiful than a fine orchard of large standard fruit trees. Standard plum and greengage are particularly delightful when they get really huge, and of course their fruits are so marvelous. It's always a temptation, in fact, to let big plum and greengage trees get out of control because they're so pleasing to look at, but remember that this will end up by limiting cropping. And don't forget walnut trees: posterity will always bless you for planting a walnut.

PLANNING THE VEGETABLE BEDS

When I discussed the various elements of the basic garden, I recommended that you allow four beds for vegetables, and there is a very special reason for this. In my view, a crop rotation cycle is essential in growing vegetables, and since I would advise a minimum of a four year rotation, you'll need four beds. More is better: for instance, if your garden is large enough, then you'll be able to rest some of the beds, as I suggested, by putting them to pasture and grazing livestock. And remember that if you're unfortunate enough to be

hit by clubroot disease, the only way to get rid of it is to rest the land for nine years! The four year rotation cycle, however, is the most practical, other things being equal.

Even if your garden is very small, don't look on the four bed system as a luxury you can't afford. The need for a rotation cycle still applies, however small the garden, and it's not much more trouble to make four tiny beds than, say, two larger ones.

Siting the vegetable beds

Once you've decided in which area of the garden you're going to keep the vegetable beds, it is a matter of setting them out. It is not particularly important in my opinion which direction the beds run, unless you intend to use a rotary tiller to dig them. In this case, it's better if they don't run up to a fence or wall, because you will find it difficult to maneuver the machine. And remember to leave paths between the beds to make working easier. If your land is sandy and well drained, you probably won't need to gravel the paths, but if it's muddy you will (see p. 241).

The four year rotation cycle

The two major worries about growing vegetables are clubroot disease in *brassica* and eel worm infestation in potatoes, and these can easily build up in the soil if *brassica* and potatoes are planted year after year in the same bed. This is the primary reason for rotating your beds annually, though other crops will also benefit from being grown in different beds in successive years.

Planning a rotation cycle is a complex business, for you have to bear in mind whether the condition of the soil, after one crop has been lifted, is really suitable for the next crop to go into. There are four rules I recommend here. First, while potatoes need to grow in heavily manured soil, root crops tend to fork in such conditions: so keep potatoes as far as possible from the root crops in the rotation cycle. Second, peas and beans — the legumes generally — like well-limed soil, but potatoes don't: so avoid growing potatoes immediately after the legume break. Third, *brassica* do like lime, but only if it has been in the soil for some time: thus, it's best to plant your *brassica* after the legumes when the lime has had a chance to establish itself in the ground. Fourth, what I call the miscellaneous crops (outdoor tomatoes, melons, the squash tribe, lettuces, radishes and so on) are better for a good mulching with well-rotted compost: since this will assist the root

crops – and certainly it will avoid the problems of forking – it's a good idea to put in the root crops after the miscellaneous crops.

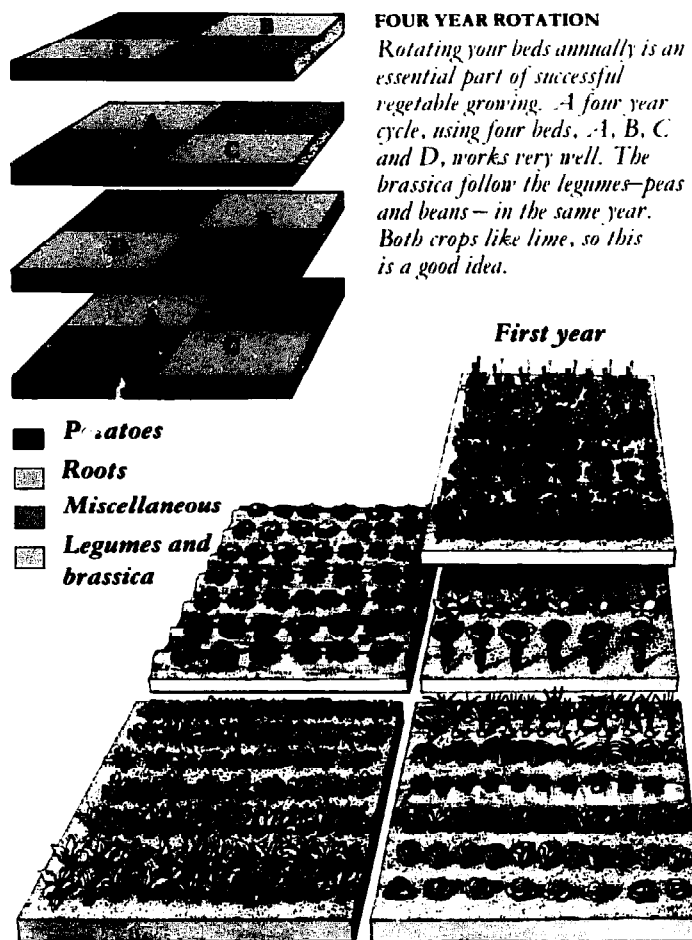
To conform to these rules, I suggest the following cycle for each of your four beds. But remember, of course, to start each bed off at a different point in the cycle.

First year Manure the bed heavily in the first year and sow potatoes. (If you like, devote a small area of the potato bed to spring cabbage, leeks and turnips in order to save for the hungry gap in the following spring.) When you have harvested the potatoes, put down a crop of winter rye which you can dig in early in the second year as a green manure.

Second year After you have dug in the green manure crop, lime the soil fairly heavily and sow peas, beans and the other legumes. Since these will be harvested from about midsummer onward, one possibility which should be considered seriously is to replace the legumes immediately with your *brassica*, which have been growing at the same time, first in the seed-bed, then in the holding-bed. This may seem to be cramming plants in a little too optimistically, but it is a technique which I use successfully. Transplanting *brassica* from seed-bed to holding-bed to final bed in such a short period of time actually seems to benefit the plants – and I always think it's wise to get plants accustomed to transplantation. The main advantage of this technique of course is that, in effect, you squeeze what would otherwise be one year of a rotation cycle between two others, and since you'll be harvesting the *brassica* in late winter this simply means that you'll be getting a lot more food from your garden. Many people devote an entire year to *brassica* and have them in their final bed before the legumes are ready for harvesting. You can do this if you have space for five beds.

Third year Assuming you have managed to get the *brassica* in during the later part of the second year, in the third year you can straightaway begin to plant miscellaneous crops. As the *brassica* are ready for lifting, and when the weather begins to warm up, replace them with the miscellaneous crops, leaving the quicker-growing plants like lettuces until the last. Remember that a good mulch of well-rotted compost will help the miscellaneous crops immensely. At the end of the third year, again I recommend putting in a winter rye crop for digging in as green manure.

Fourth year Root crops should be sown in the fourth year, when the manure which was spread for the potatoes is no longer exercising a direct influence in the soil.



If your garden is large enough to extend the rotation cycle, then leave the plot lying fallow during the fifth year, or grow yet another green manure crop – preferably one of the deeper-rooting crops such as alfalfa or comfrey, because they will be of longer-lasting benefit to the soil. Otherwise, start the whole cycle all over again by manuring heavily and sowing potatoes once more.

Alternative rotations

The four year rotation cycle is, I should emphasize, just one of several possibilities. I find it suits me very well, despite a couple of objections which the purist might make. The first objection is that I put tomatoes in with the miscellaneous crops, not in the potato patch, as is more common: thus, there are two solanaceous plants growing in the same bed in a space of less than four years. However, I don't grow very many outdoor tomatoes, and since I do like to have a lot of potatoes I'm a bit reluctant to give over some of the potato bed to tomatoes. If you really are a purist, then cut back on the potatoes and plant the tomatoes with them. In this way you will be certain that you are not encouraging disease.

Planning the Food-Producing Garden

The second objection is that I plant radishes — which are cruciferous — along with the miscellaneous crops, instead of in the *brassica* bed, thus tempting fate to nurture or perpetuate clubroot disease in the soil. In fact I don't think clubroot is a serious possibility here, because the radishes are harvested quickly, before the disease really has a chance to establish itself. But never leave the radishes to get old in the ground, or you might have a problem with clubroot.

Try out my suggested rotation cycle, but of course if it doesn't suit you, consider some alternatives. For example, I know of very successful gardeners who always follow *brassica* with the legumes, not, as I recommend, the other way round. Another possibility is to have a much less strict rotation cycle, where crops are jumbled up. The only rule here is to avoid planting the same crop in one bed in successive years. Personally, since I'm not good at remembering just what I've had in and where, I prefer a clearer system to work to. But if you keep good records, then the casual rotation might well suit you. I would advise making a map of your garden and noting what you have sown and planted, and when, together with details of how you have treated the soil that year.

PLANNING A HERB GARDEN

At the Covelo Garden Project in California, you can find what is probably the most elaborate and sophisticated herb garden in the world. A large amphitheater has been excavated, and the inside slopes have been terraced: the terraces on the north side are facing south and those on the south side face north. At the highest point on the terraces the soil is kept well drained and dry, while the lower parts surround a pond which provides moisture. So the optimum conditions have been created for growing all the culinary and medicinal herbs in the world — whether they like sunny, shady, wet or dry conditions — and it presents the most pleasing and attractive scene.

No doubt when you plan your herb garden you will be content to settle for something less grand than the Covelo garden, although similar principles of siting the individual herbs will apply. Herbs have a great range of climatic and soil preferences — from the hot sun and dry sandy soils favored by the herbs which have a Mediterranean origin like anise, basil and oregano, to the partial shade and rich, damp soil favored by plants like lovage and mint. The individual preferences of the different herbs are described in The Cultivation of Herbs chapter (pp.191-202). Obviously you will

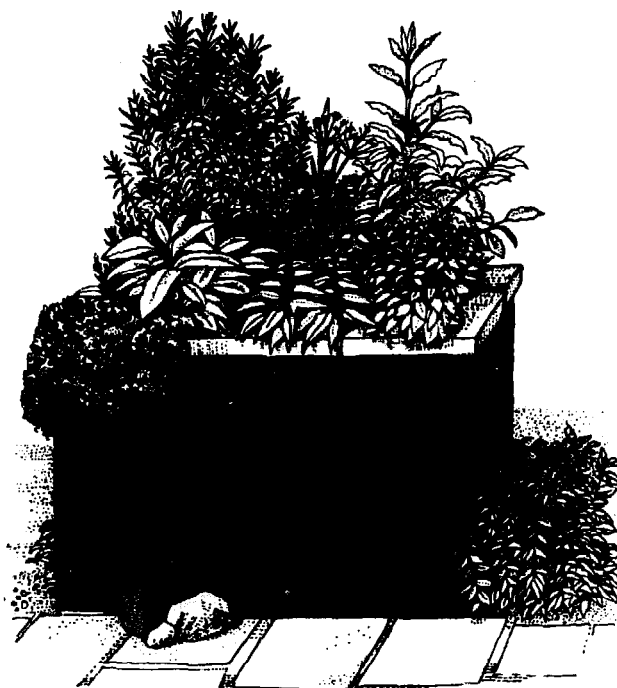
have to do with less than ideal conditions for many of the herbs you grow, but when you plan your herb garden try to select a site which offers at least a modest range between full sun and partial shade.

As I have already suggested, it is best to site your herb garden near to the kitchen door. If sprigs of this or that fresh from the garden are within easy reach when you are cooking, you might resist the temptation to pick out a jar of dried herbs from your store cupboard. Needless to say, fresh herbs are infinitely more fragrant and flavorsome than those which have been drying up over a number of years.

While herbs vary as to whether they prefer sun or shade, most do like a sheltered spot, so if you can manage to put the herb garden against your kitchen wall this will certainly help.

Raised bed for herbs

An excellent idea for a herb garden is to build a raised bed with stone or bricks. There are a number of advantages here. First, the soil will be well drained and dry, and this is important for many herbs. Those which like damper soil and more shade can be planted at the base of the raised bed at the front or side. Secondly, the raised bed



RAISED HERB BED

You can build a raised bed made of brick or stone for your herbs. The soil will stay dry and well drained, which suits most herbs; the height of the bed means less bending; and the extra surface area encourages those herbs which like to straggle across walls.

entails less stooping for planting, tending and picking. And thirdly, it provides more surface area for the straggly plants to trail over the walls.

If you build a raised bed against your kitchen wall, however, don't build it higher than the sills of the house, or you will find yourself eating herbs in a damp house.

Rockery for herbs

Since many of the herbs are delicate and beautiful plants, another idea you can consider is to grow them in a small rockery (a miniature version of the Covelo herb garden, perhaps). If you're in a sandstone area, the pinks, reds, ochres and whites of the stones you use in the rockery will complement the rich greens of the herbs. The rockery, too, will have the advantage of being well drained. It may be that you won't be able to keep the damp-loving plants like mint in a rockery. If so, grow your mint in that damp shady patch which is found at the end of most gardens.

PLANNING THE FRUIT GARDEN

Two hundred years ago in his *Cottage Economy*, William Cobbett advised his cottagers not to grow fruit: in his view it took up too much good land and served only to give children belly-aches. But then Cobbett wasn't as vitamin-conscious as we tend to be nowadays, and personally I think there's nothing to compete with fruit for providing you with gastronomic delight and with what your body needs at the same time. There are few pleasures equal to eating the first juicy strawberries of the year, or a fine, sharp fruit cocktail picked from your own garden. Besides, the sense of spiritual well-being which comes from walking through a glorious orchard, in full bloom or in full fruit, is one of the great luxuries of gardening.

However, planning a fruit garden requires a lot of hard thought. For one thing, you are dealing with three different kinds of plants: fruit trees, soft fruit bushes, and ground plants. For another, you must take into account what else you are growing in the garden, since all fruit will draw a great deal of nourishment from the soil, and fruit trees create large areas of shade. Finally, and this is the important consideration, fruit-growing will take up a great deal of space in the garden.

How much fruit to grow

The size of your garden will have a fundamental influence on how much fruit you can expect to grow. Most gardens can – and should in my view – accommodate some soft fruit. But if your garden

is tiny, I doubt that the space-effectiveness of fruit trees – even the dwarf varieties or trained trees – makes them worthwhile. It is a pity, but you ought to think how many apples, say, you will get from a single cordon, and weigh this against the number of beans or potatoes you will get from the same piece of land.

Even if you have a garden with more space, you must think carefully about planting fruit trees. Remember that what seems to take up only a little space now will be a quite different proposition in ten years' time. Unless your garden is really enormous – big enough for a full-scale orchard – I would recommend you to avoid standard (full size) fruit trees altogether. Several dwarf varieties, and, say, a few cordons and espaliers are a better use of space. This of course, limits the kind of fruit you can have: many fruit trees can be dwarfed or trained, but you can't do this with stone fruit trees such as plums, greengages or cherries.

If you have a large area in your garden to devote to fruit, then standard trees can be considered. An area 175 feet (54m) square, for example, will accommodate 16 huge standard apple or pear trees. When these are mature, they will produce up to eight bushels of fruit each. The initial drawback with standards is that you won't get fruit until three to six years after they have been planted, although you will get fruit for 40 or 50 years after that. Dwarf varieties fruit earlier but have a shorter life. In the same area, you could plant 64 semi-dwarf trees and get about the same total yield (a semi-dwarf gives about a quarter of the yield of a standard), and they will fruit two to five years after planting.

Soil for fruit trees

When choosing a site for a fruit garden, take into account the quality of the soil. Most fruit needs good rich soil, with plenty of manure or compost worked into it, because the trees and bushes quickly exhaust the nutriment in the soil. Figs will grow in poor soil, and peaches prefer a light, sandy soil. All fruit requires well-drained soil, so if your land is wet, you will have to provide drainage (see p. 240). You will also need deep soil for fruit trees: standards and semi-dwarfs, particularly, send roots deep into the ground, although fan-trained fruit trees planted against a wall can put their roots out under unproductive land where a path or patio has been laid. It is worth digging deep when planting any fruit tree.

In a large orchard, you may think you will be able to grow at least some crops underneath the

standards. Fundamentally you can't: a few daffodils might grow, but nothing edible. The best plan, if you want to use the space, is to graze sheep (just so long as they can't reach up to the leaves and branches of the trees). The manure makes a beneficial contribution to the soil in the orchard.

Generally, young fruit trees bear more fruit, more quickly, if the ground over the roots is left bare. Commercial fruit growers achieve this by spraying the area with herbicides, but I would suggest simply mulching the area heavily. However, if the ground is left bare, cut down on the amount of manure you put into the soil since this encourages tree-growth at the expense of fruit-formation. Don't clear the ground over the tree roots by mechanical means, because you may damage the roots near the surface.

Shade from fruit trees

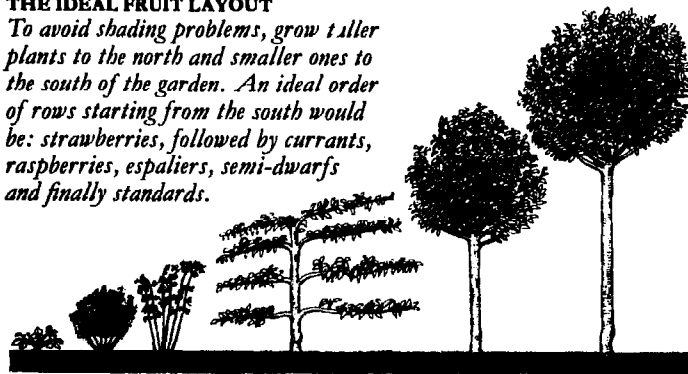
Large fruit trees cast a considerable amount of shadow. If you can plant them at the north end of the garden the problem is easily resolved, but if they have to go in at the south end, remember that you will be able to grow only shade-loving plants such as rhubarb or mint immediately to the north of them.

Laying out a fruit garden

In view of the shading problem, I suggest you arrange the fruit garden in a stepped form. For example, to the north of the garden, put in a row of standard fruit trees, then, working progressively south, a row of semi-dwarfs, then bush trees, then some apple or pear fruit espaliers. In front of these, put a few rows of raspberry canes, then a few currant bushes, and finally a strawberry bed. This is an ideal arrangement of course, and obviously you would need an extensive garden to do it. But the principle is quite simple: have the taller plants to the north, and the smaller to the south and you won't have a shading problem.

THE IDEAL FRUIT LAYOUT

To avoid shading problems, grow taller plants to the north and smaller ones to the south of the garden. An ideal order of rows starting from the south would be: strawberries, followed by currants, raspberries, espaliers, semi-dwarfs and finally standards.



Choosing fruit trees

While deciding which fruit trees to plant is largely a matter of taste (and of the conditions in your garden), one important consideration is fertilization. It is no use planting, say, McIntosh apples alone for they must have another variety of apple to act as a pollinator. One way to achieve this is to get what is called a "family" tree – that is, one root stock which has had several varieties grafted on to it. Another solution is to grow several cordons or other small forms of different varieties. If you're lucky enough to have a friendly neighbor who also grows fruit trees, consult with him before selecting your trees. You'll both benefit if your trees pollinate each other. And of course, even if your neighbor isn't a friend, examine his trees anyway – he can't prevent the bees from carrying his pollen to your blossoms, and he shouldn't want to, since he will profit from the arrangement as well.

In general, my advice is to select as wide a variety of fruit trees as possible, bearing in mind the need for fertilization. Grow some very early varieties of fruit, a main crop, and some late ones which store well. If you do this, it won't be difficult to achieve self-sufficiency in fruit. One final piece of advice, though, is that some varieties of fruit are particularly sensitive to locality. So be sure to consult a local expert fruit-grower about which varieties do best in your area.

Protecting the fruit

One of the primary factors to take into account in planning a fruit garden is whether you will be able to protect the fruit from birds. Birds are probably the biggest single hindrance to successful fruit growing. Plan to protect soft fruit completely – a fruit cage (see p. 184) is probably the only really effective answer here. Cherry trees are particularly vulnerable to birds, and unless you net them completely, the birds will have stripped them bare before you have a chance to eat a single cherry. Fruit trees can be ravaged by bullfinches, and I know of no protection against these pests except the gun.

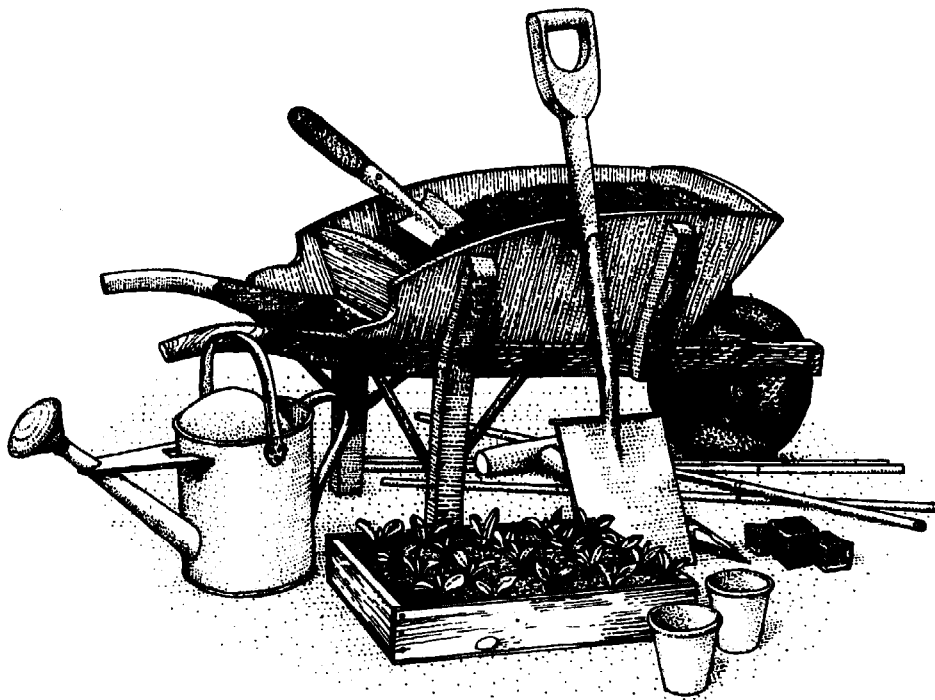
You must also consider the damage which your trees may suffer from other animals. Hens will not attack fruit beds, but they do peck at the fruit, so keep them away from fruiting trees. Both geese and goats need to be kept away from all trees: they will bite the bark off a tree virtually on sight and kill it immediately. Solve the problem either by keeping them right out of the orchard, or by circling the trunks with wire netting, which makes it impossible for the animals to reach the trees.

THE PLANNING REQUIREMENTS OF GARDEN VEGETABLES

	Prefers full sun	Prefers partial shade	Tolerates full shade	Prefers well-drained soil	Prefers damp soil	Tolerates dry soil	Prefers sandy soil	Prefers clay soil	Prefers rich soil	Tolerates poor soil	Prefers high pH (alkaline) soil	Prefers neutral pH	Prefers low pH (acid soil)	Requires long growing season	Requires short growing season	Benefits from frost	Tolerates frost	Tolerates wind
Artichokes globe	●			●				●			●		●					
Jerusalem			●	●		●		●			●		●				●	●
Asparagus	●			●		●		●			●		●				●	
Eggplants				●				●				●		●				
Beans broad		●					●	●			●						●	●
bush	●			●				●			●			●				
Lima	●			●				●			●		●					
pole	●			●				●			●			●				
soy	●			●				●					●					●
Beets			●	●	●			●			●							●
Broccoli			●	●	●			●	●		●		●				●	●
Brussels sprouts			●	●	●			●		●	●		●		●			
Cabbage			●	●	●			●		●			●				●	●
Chinese cabbage		●		●	●			●		●				●				●
Peppers	●			●	●	●		●			●		●					
Cardoons	●			●		●		●	●		●		●					
Carrots	●			●	●	●		●			●			●				●
Cauliflowers			●	●	●		●	●			●		●				●	●
Celeriac			●	●	●			●				●				●		●
Celery			●	●	●			●			●		●		●			●
Chicory			●	●	●			●	●		●							●
Cresses			●	●	●			●						●				●
Cucumbers	●			●	●			●			●			●				
Dandelions			●	●	●			●	●								●	●
Endive		●	●	●	●			●	●		●							●
Florence fennel	●			●	●			●			●							
Hamburg parsley	●			●	●			●			●		●					●
Kale			●	●	●			●		●			●		●			●
Kohl-rabi			●	●	●	●		●		●								●
Leeks		●	●	●	●			●			●		●				●	●
Lettuce			●	●	●	●		●			●			●				●
Squash tribe	●			●	●			●			●			●				
Melons	●			●	●	●		●			●			●				
Okra	●			●	●	●		●			●			●				
Onions	●			●	●	●		●			●		●					●
Parsnips			●	●	●			●			●				●			●
Peanuts	●			●	●	●		●			●		●					●
Peas		●		●	●			●			●			●				
Potatoes		●		●	●			●			●		●		●			●
Radishes			●	●	●			●					●		●			●
Rhubarb			●	●	●			●			●		●				●	●
Salsify		●		●	●			●			●		●					●
Seakale			●	●	●			●			●							●
Spinach			●	●	●			●			●			●				●
Spinach beet			●	●	●			●			●						●	
Rutabagas & turnips			●	●	●	●		●			●		●				●	●
Sweet corn	●			●	●			●			●		●					
Swiss chard			●	●	●	●		●	●		●			●				●
Tomatoes	●			●	●			●			●		●					

CHAPTER FOUR

The Essentials of Good Gardening



*Containing the methods of digging, composting,
fertilizing, soil testing, propagating, grafting, pruning,
training, mulching, protecting against pests, storing,
and gardening by the Deep Bed technique.*

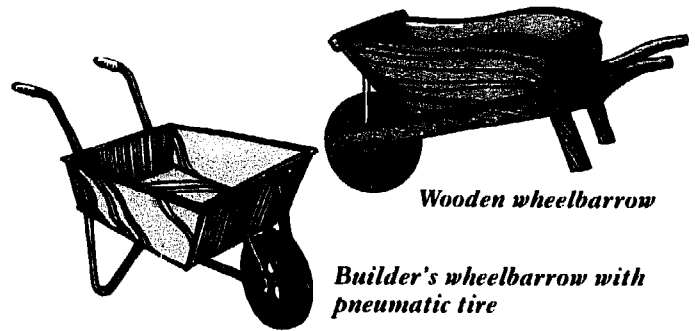
Treating the Soil

Clearing overgrown land

Land left to itself in a temperate climate will turn first to grass, then to scrub, then to forest. So if you start with badly neglected land, the first thing to do is clear it.

Long grass or tall weeds should be cut down with a scythe or sickle. Scything is faster, but for a small garden it probably is not worth buying a scythe. But don't try to cut bushes with either a scythe or a sickle or you will quickly ruin the blade. A long-handled slasher, or brush-hook, or machete is best for bushes, or, if you haven't got one of these, a short-handled slasher, an axe or even a hatchet. However, if you have to dig out the bushes later on anyway, it's better not to cut them down at all: if there's no top left on the bush you will have nothing to heave against when you come to pull out the roots. After you have got bushes out, you should burn them if local laws permit it, because the ashes will give you potash for your soil.

You will need a wheelbarrow to shift what you clear. In my view, the most useful (and also beautiful) kind was the old fashioned gardener's barrow with a wooden wheel and wooden extension sides which could be fitted for high, light loads and taken off for heavy ones. Nowadays, a good wheelbarrow to get is a builder's barrow



Wooden wheelbarrow

Builder's wheelbarrow with pneumatic tire

with a pneumatic rubber tire. These move a lot more easily, especially on uneven ground, than those that have solid tires.

Establishing a vegetable garden

If you throw some seeds on top of the ground the birds will eat them. If you dib a cabbage plant into a grass field, the grass will smother it and it will die. If you remove the grass, and all other wild plants, and dib a cabbage plant into the bare earth, weeds will grow up unless you stop them, and again the cabbage will be smothered. All our crop plants have been evolved over the centuries to be good to eat, to crop heavily and to be nutritious, at the expense of other qualities, like hardiness and competitiveness among wild plants.

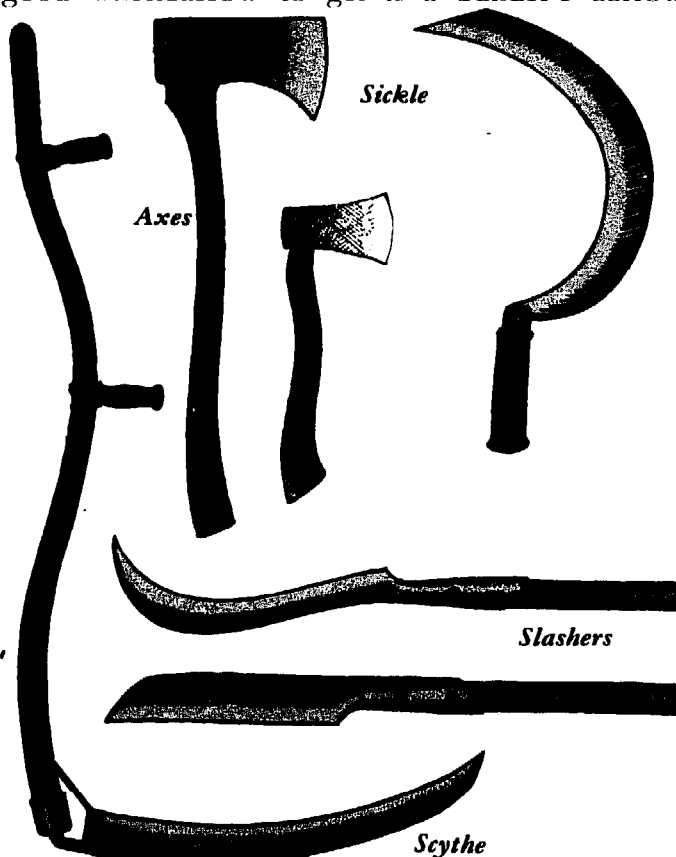
So, if you want to feed yourself from the produce of your soil, you must cultivate it. There is such a thing as the "no-digging technique" and I will discuss this, but if you inherit a normal garden, whether well-maintained or neglected, or if you want to establish a garden in a grass field, you will have to start by digging, or turning the soil.

Now, assuming you have a plot of old grassland which you want to turn into a garden, there are several ways you can go about it. One is with pigs. Run pigs over your plot (keep them in with an electric fence) and they will root up the turf and leave it in a condition which makes it easy to fork over and turn into a garden.

Bastard trenching

The most traditional means of rescuing neglected ground is with a spade. And when you dig old turf for the first time with a spade you must make a very thorough job of it. If you just turn the grass over, it will come up and grow again and you will have endless trouble. You cannot plant garden plants in half-buried turf. It is far better to do it by the time-honored method of "bastard trenching" (see illustration right).

Once you have completed the bastard trenching, your grass plants, roots and all, will be completely buried more than a foot deep. They will not grow



up again to haunt you. Your soil will be loosened to a depth of about two feet, which is good for aeration, drainage and deep-rooting plants. And your new topsoil will be bare, broken up, and ready for planting with any crop immediately.

Some gardeners will tell you not to bury the scalped-off turf, but to lay all the turves in a pile, upside down, on top of each other. They will rot down over time and make the basis of splendid potting compost. There is nothing wrong with this, as long as you remember that you are severely robbing the bed from which you take the turf.

You can bastard trench any garden that you take over; if it is not grassland you can throw manure or compost into the trenches instead of turf. I would bury manure, compost, or turf once with a new garden, but I would never do it again, because I would rely on the earthworms to do it for me. Let them work their backs, and not me mine. Bastard trenching is especially worthwhile if your land is heavy, because it will break up any pan (hard impervious layer) that there might be down below.

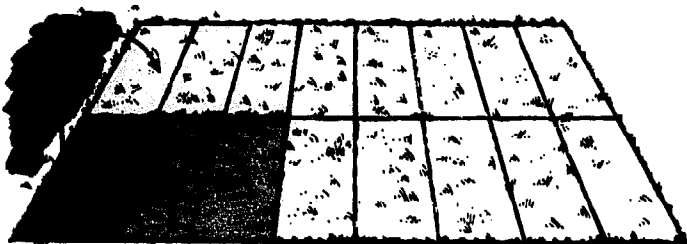


BASTARD TRENCHING

Divide the bed in half lengthways. Mark out, with string if you like, a trench two feet (60 cm) wide across one half of the bed. Shave two inches (5 cm) of turf off it and pile this next to the top end of the other half of the bed. Dig earth out of the trench to a spade's depth, and put it next to the pile of turf. Mark out another trench next to the first. Scalp the turf off this, throw it into the bottom of the first trench and break it up small with the spade. Dig a spade's depth of earth from the second trench, invert it and throw it into the first trench. Carry on like this until you reach the other end of your plot. Cross over to the other side and work your way back (see illustration, right) and fill the last trench with the turf and earth from the first one.

Once you have dug your land over in this way, spread plenty of compost or manure on the surface. The earthworms will drag this deep down into the soil, and dig and aerate the soil for you themselves. Some old-fashioned gardeners will tell you to bury your manure or compost so as to incorporate it into the soil. This may well sound reasonable, but it is now known – and organic gardeners have proved it over and over again – that if you just lay compost or manure on top of the soil the earthworms will dig it in for you. In a very short time it will just disappear. And the more humus you get into your soil in this way the quicker it will disappear, because the more earthworms there will be and the more active, biologically, the soil will be. I bury manure when I plant potatoes, and I would bury manure if I took over an old, chemically-worked and exhausted garden. I would never bury manure if I had dug in old turf, for the simple reason that turf is manure. I would spread manure or compost on the surface, though, for the worms to drag down.

It will pay you for the first few years – until you have put a lot of compost on your land – to dig once a year, and if you want to turn your newly created garden into a deep bed garden (see p. 106), the first year after bastard trenching is a good time. For conventional gardening, use a fork for digging after the first year as long as your earth forms large enough clods. Just dig trenches one spit deep. Put the dug out earth in a pile as you did before, turn the next spadeful over into the empty trench, and keep going until you have been right round the plot; throw the first pile into the last trench (see below).



Digging with spades and forks

Even if you take over a well-ordered garden you may still have to dig. But don't dig just for the sake of digging; dig shallowly and in moderation. Your soil will get deeply dug whenever you grow potatoes, or celery or the other vegetables that grow in trenches or on ridges. The soil needs to be loosened to some depth for root crops like parsnips or carrots, but you can do this without inverting the soil – just push a fork in and break

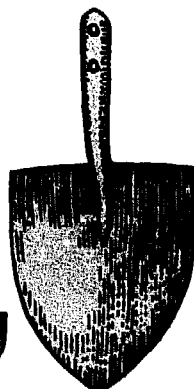
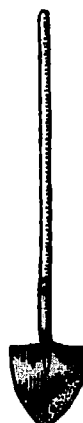
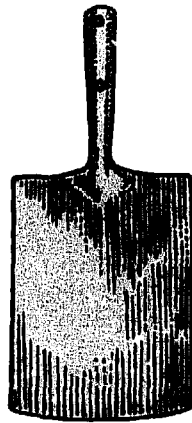
it up. For shallow rooted crops a mere shaking up of the top four inches (10 cm) of the soil is enough. Time spent in what old-fashioned gardeners called "thorough digging" is wasted and in fact counter-productive.

The basic tool you need for digging is, obviously, a spade. Stainless steel spades are excellent but extremely expensive, and I doubt if the expense is justified, so long as you look after an ordinary spade properly (see p. 244).

There are two types of spade: the round-pointed spade, with a heart-shaped blade and a long handle; and the square-pointed spade, with a rectangular blade and a shorter handle which is shaped into a "T" or a "D" at the end (the "D" handle is by far the more comfortable for digging.) A round-pointed spade with a long handle is the spade I prefer. Without too much backbending, you can work comfortably and quickly along the line of a furrow for, say, potatoes, or you can dig a trench for, say, celery; and the spade is



"D" handle

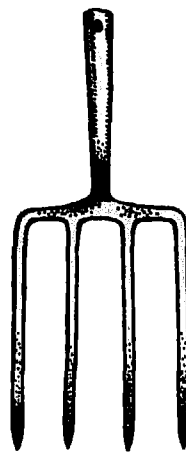


"T" handle Square-pointed spade Round-pointed spade

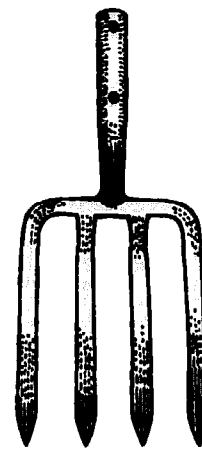
incomparably better for excavating holes. However, for precision digging the square-pointed spade is better: it's difficult to dig down vertically with a round-pointed spade since the blade naturally goes in at an angle. For bastard trenching, or for digging a deep bed (see p. 106), I recommend using a square-pointed spade for turning the upper layer, and then a round-pointed spade for loosening the ground below.

For excavating hard earth, it's best to loosen it first with a pick, and then remove it with a spade. If you watch a professional gardener use a spade you'll see how the right knee shoves against the right hand to push the spade into the soil.

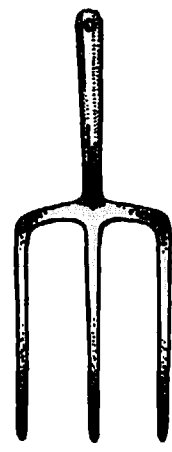
The experienced gardener often uses a fork rather than a spade. The advantages are that it's likely to be quicker, breaks up clods better and is easier to push into the ground than a spade. And



Spading fork



Potato fork



Manure fork



AERATING THE SOIL

The worms will usually aerate your soil for you, but they tend to be less active in dry weather, and in land which has lain fallow for some time. In these instances it is worth prodding your soil with a fork to aerate it.

if you are cursed with creeping root weeds such as couch grass, ground elder or bindweed, then a fork is marvelous for raking the long roots out of the ground. It goes without saying, of course, that a fork is better than a spade for digging out root crops (a potato fork has flat tines to stop the spuds being speared). A manure fork has thin tines so that the manure will fall easily through on to the ground as soon as the fork is shaken. The only times a spade is really essential are for digging in grassland, turning heavy clay, or digging light sand.

Digging with a machine

There are two basic sorts of garden tractor: the kind which actually pulls a sort of plowshare along and inverts the soil as in a plowed field, and the rotary tiller type. The former has to be a very strong and heavy machine to be of any use and I would suggest it only for people who have large gardens, say half an acre (2000 sq m).

Rotary tillers on the other hand are smaller but nonetheless effective, and they accord more nearly with the ideal of the organic gardener which is not to invert the soil too much but to leave the topsoil on top.

My own feeling about all garden tractors is that they are only really worth buying if you are going to grow and sell vegetables on quite a large scale. I have found, after most of a lifetime of doing it,

that I can provide all the vegetables for a large family quite easily with hand tools alone.

Having said that, I freely admit that a rotary tiller will perform the equivalent of digging, the equivalent of forking, and go a long way toward breaking down clods, although a raking with a hand rake afterward is generally necessary before you can plant seed. A rotary tiller will kill weeds, and is good at incorporating green manure into the soil. It will even reclaim old grassland for you as long as you go over the ground many times, say once a month for several months. This is because you must hit the tough grasses again and again, as they begin to recover, so that eventually you kill them and incorporate them into the soil. If you till old grassland and broadcast a good cover crop, like mustard, or rye in the winter, and till that in when it is at the flowering stage, you will come near to producing a good garden soil. If you take time and dig in two successive cover crops, your soil will be even nearer perfection.

If you do decide to buy a rotary tillage implement, there are one or two things you must bear in mind. First, it's important to choose one for a specific job, which to my mind is very sensible - you must bear in mind that there are two kinds: the kind that turns itself along by the turning of its own drum, and the kind that pulls itself along with the long wheels while the drum just churns up the ground behind. The former probably does more work for less power than the latter works the garden as well as the middle of your considerable strength is needed to keep it moving. You have to hold it back when it starts to dig too deep.

Overall,

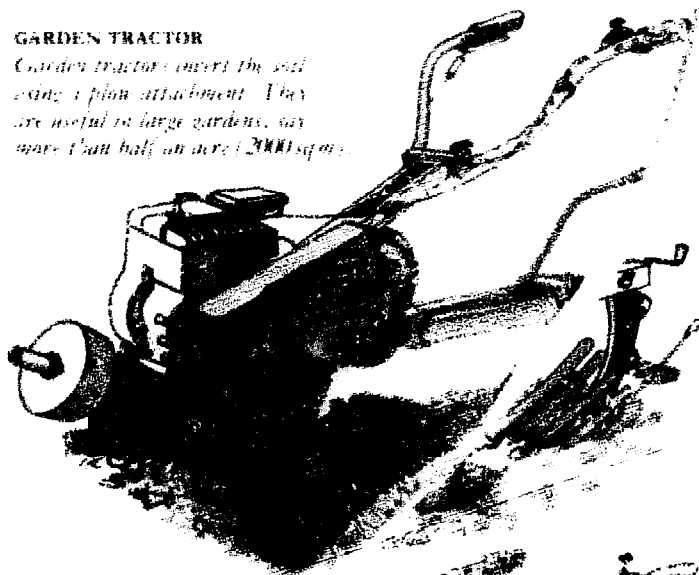
The wheelbarrow is generally bigger, more maneuverable, easier to manage and move along behind them and they do it for themselves. Some of them even have the gear, so that you can back away in any direction. Both kinds can be used with a wide range of attachments such as hedge clippers, even a circular saw.

ing” principle of the “no-digging” technique is to have at least two inches (5cm) of aged compost on the surface of your soil every year. Renew it from year to year, and you simply scatter seeds, or plant your plants, in that. That’s all there is to it. Some no-diggers have not put any compost in their ground for thirty years and yet every year they get fine, disease-free crops – crops which are consistently much better than crops grown on chemically-fed land.

But no-diggers do use an awful lot of compost. In fact they put so much on their soil that it is

GARDEN TRACTOR

Cummins tractors mount the soil-coring & plan attachment. They are useful in large gardens, on spare half-holms, etc. (2000) spec.



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almost pure compost. All the no-diggers I know bring in organic material, in large quantities, from outside their garden, because no matter what crops they grow they cannot obtain enough organic material from their own gardens to make the necessary compost. One no-digger I know gets tons of swept-up leaves delivered by the local parks department. Another lives next door to a large flower nursery, whose proprietor is only too pleased to dump tons of what he calls "trash" over the fence.

I am not decrying these practices; I think they are marvelous. All gardeners should be constantly on the lookout for organic material and seize it whenever they can. But obviously every gardener in the world cannot do it; and you can be sure that if one plot of land is using this technique it is robbing another plot of land which is either being flogged with chemicals or left unproductive.

COMPOST

It is Sir Albert Howard, who first experimented with making it at Indore, in India, before World War One. But of course compost has existed ever since green plants invaded the land. Any vegetation that falls to the ground and rots "aerobically", meaning that it uses oxygen as part of the rotting process, turns into compost. (Vegetation that rots "anaerobically", or without oxygen, turns into peat and ultimately, under pressure, into coal.) But why then go to the trouble of making compost? Even when you pull weeds out and lay them on the ground they rot and the earthworms pull them down into the soil, making compost. If you dig them in, the same thing happens but underground, and quicker. So why not just dig any vegetation you can find into the soil and let it rot and turn itself into compost?

The reason is that the bacteria which rot vegetable matter (by eating it) use a lot of nitrogen in the process. So when you dig vegetation into the soil the bacteria seize all the nitrates and nitrites that are in the soil and use them to break down the vegetation. Thus they starve the soil of nitrogen to the detriment of the plants. The starvation is only temporary, for when they have finished their job the bacteria die and release the nitrogen again, plus any nitrogen that was held in the vegetation. So you get it all back in the end. But you have to wait for it.

A far better method is to put all surplus vegetation through a compost heap. Here you supply the nitrogen required yourself (if you have it, or can get it) so that the putrefying bacteria get to work quickly to break down all the organic matter and — this is an important factor — generate a lot of heat. The compost heap should reach a temperature of at least 150°F (66°C). In fact many a compost fanatic will take the temperature of his compost heap as a doctor might take the temperature of his patient. The heat in the compost heap is crucial: first, it kills most weed seeds and disease spores; second, it causes actual changes in organic matter and these are beneficial.

But what happened before Sir Albert Howard's invention? Well, farmers of course have made compost since the year dot. They throw straw into the yard, and then let their cattle or pigs or poultry do the work. The animals produce vast amounts of dung and urine which they tread into the straw. At that point, when the muck becomes consolidated, and therefore anaerobic, it may not rot down completely in the yard, so the farmer

will have to make a "miser" of it, which is to say, a heap for a dung-heap. This process aerates the muck thoroughly and it turns into compost, which is exactly what Sir Albert achieved with his heaps of vegetable matter at Indore. It was this muck which was the basis of good farming before the invention of artificial manures. In fact it enabled farmers of the early nineteenth century to grow more wheat per acre than is grown as a national average even now, despite huge applications of power-derived fixed nitrogen.

But, the gardener hasn't got an animal yard, so if he wants to garden without large amounts of bought nitrogen he must make compost. Plants grown in compost-rich soil grow tough and strong, and very resistant to most diseases and pests. Applied inorganic nitrogen on the other hand, makes rapid and sappy growth which has no resistance to disease. Moreover, compost will keep the soil healthy.

Making compost

There are as many methods of making compost as there are rabid compost enthusiasts. Sir Albert Howard, for example, made a six inch (15 cm) layer of green matter, then a two inch (5 cm) layer of dung or manure, then a layer of earth, ground limestone and phosphate rock, then another layer of green material, and so on to the top. He found that the optimum size of heap — which he didn't enclose in a bin of any sort — was ten feet (3 m) wide and five feet (1.5 m) high.

Another method, invented by Dr Shewell-Cooper, who has also spent many years experimenting with compost, is to use a wooden bin, inside which the first layer of vegetation is laid directly on the earth so the worms can get into it easily. Alternate layers of vegetation and nitrogenous substances—dung, manure and so on—are then added and eventually the whole pile is covered with a piece of old carpet. This method makes magnificent compost. If you use a black plastic sheet instead of carpet, you will get good compost very quickly. You must, however, keep the heap well watered under the plastic, because the bacteria and other organisms need plenty of moisture.

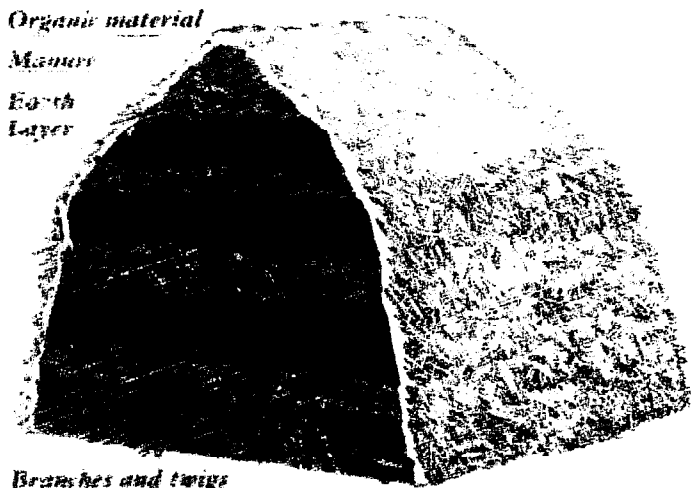
If you don't have a bin, and can afford the time and effort, it's a good idea to turn the compost. After the heap has got to its hottest and then started to cool down, turn it, putting the top and outsides in and the insides out. Sprinkle water on as you do this. The water and the aeration speed up decomposition and raise the temperature again. My own recommendation is that you use compost

Organic material

Mature

Earth

Layer



Branches and twigs

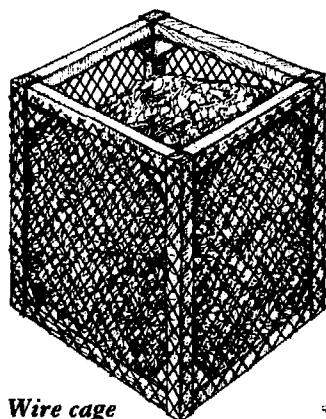
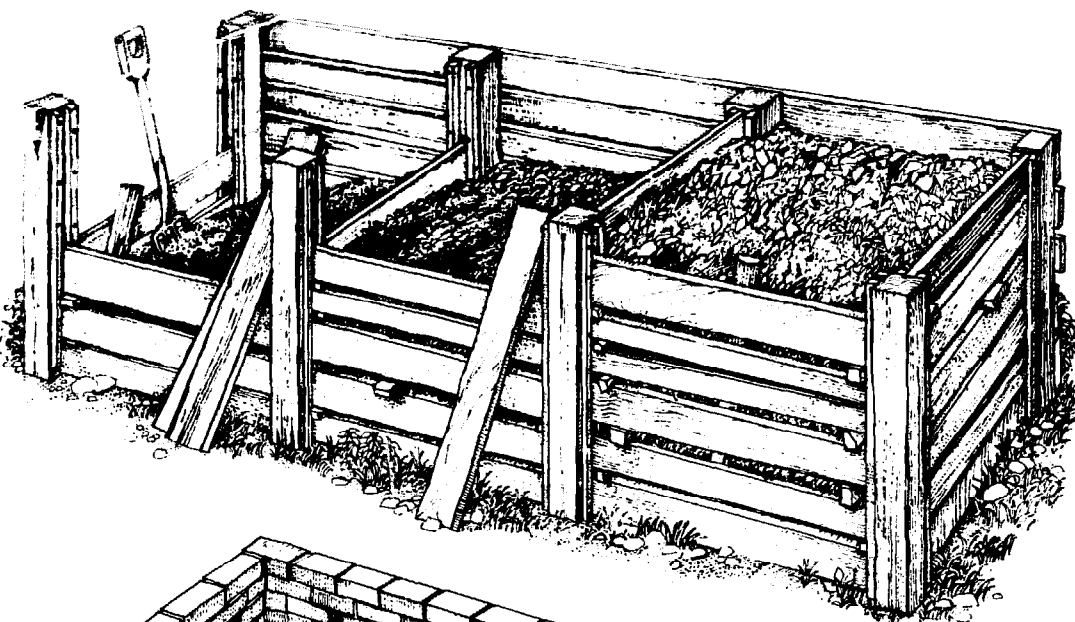
BUILDING A COMPOST HEAP

The first step in building a compost heap is to choose a site. It should be in a sunny, well-ventilated area, and it should be accessible to water. The next step is to build the heap. It should be built in layers, with the top layer being the most organic material, the middle layer being the most mature material, and the bottom layer being the most earthy material. The top layer should be about 12 inches thick, the middle layer should be about 12 inches thick, and the bottom layer should be about 12 inches thick. The heap should be built in a conical shape, and it should be covered with a layer of earth or straw. The heap should be turned over every 4 to 6 weeks, and it should be kept moist. When the heap is finished, it should be about 2 to 3 feet high, and it should be about 2 to 3 feet wide. The heap should be kept for 6 to 12 months before it is used.

the heap is built, it should be covered with a layer of earth or straw. The heap should be turned over every 4 to 6 weeks, and it should be kept moist. When the heap is finished, it should be about 2 to 3 feet high, and it should be about 2 to 3 feet wide. The heap should be kept for 6 to 12 months before it is used.

COMPOST BINS

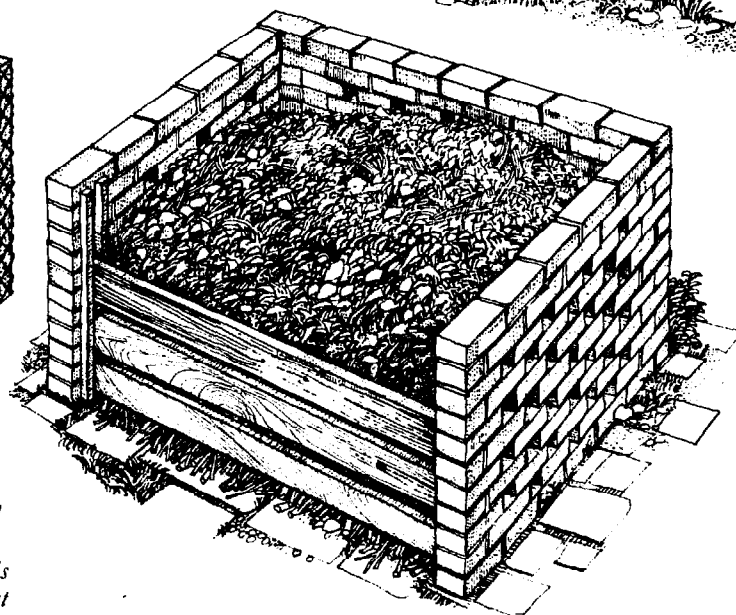
Compost bins are useful for storing compost. They are made of wood, brick, or concrete, and they are about 5 feet high and 5 feet wide. They are set in bare earth, and they have gaps in the sides for ventilation. When a bin is full, it should be covered with earth, carpet, or black plastic.



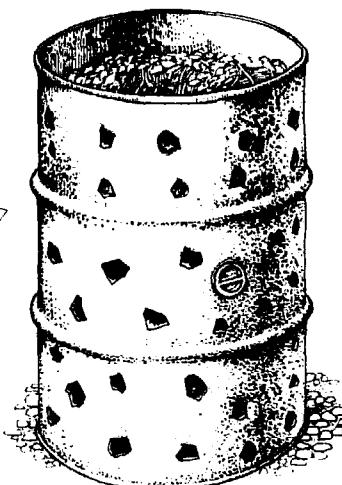
Wire cage

COMPOST IN CONTAINERS

You can make compost in containers such as perforated oil drums or small wire cages. The ratio of surface area to volume is not ideal in small containers, but the compost is certainly worth having nonetheless.



Brick compost bin



Oil drum

bins, three if possible, about five feet (1.5 m) square and five feet (1.5 m) deep. It doesn't really matter whether the bins are made of wood, brick, stone or concrete, provided they are well-ventilated (though not too well-ventilated or they won't retain heat). If you have wooden bins, use wood treated with wood preservative; otherwise they will rot down along with the compost. And it's a good idea to make them so you can take out the front planks for easy access. If you fill one bin at a time, you should always have one that is ready for digging in, or spreading on your vegetable beds. In a very small garden you could use an oil drum punched with ventilation holes.

Fill the bins with a layer of any vegetable matter, say, six inches (15 cm) to a foot (30 cm) deep, then either a sprinkling of high nitrogen matter, or a two inch (5 cm) layer of animal (or even human) manure. Go on building in this way till the heap is complete. Water the material if it is very dry as you put it in. Don't bother to add lime, but throw in a few spadefuls of earth from time to time when you are building since this will introduce worms and bacteria.

If you haven't got manure and have to buy high nitrogen material, then fish meal, blood meal or seaweed meal all do the job. As a last resort, use artificial nitrogenous fertilizer – though I've personally never yet come to that. Finally, when the bin is complete, cover with a layer of earth, a piece of old carpet or a sheet of black plastic and let alone for a while.

If you just can't get round to building a bin, or if your existing bins are full, then make a free-standing heap. Lay any branches and twigs you can find on the ground to a depth of, say, nine inches (23 cm). If you have it, dump any old but unrotted compost material from another heap on this, then lay organic matter on this, day after day, up to about a foot (30 cm) high. At this point, put on a sprinkling of highly concentrated nitrogenous material such as fish meal, or a two inch (5 cm) layer of manure if you have it. Continue building like this as more organic matter becomes available. Keep the sides of the heap quite straight at first and tread it nightly. Water each layer if it is dry. When you've got as much as you want, encase the heap in earth or cover it with old carpets.

GREEN MANURE

The point of green manuring is to increase soil fertility by growing a crop for the express purpose of working or tilling it into the ground. Alternatively, the crop can simply be cut or pulled

and left as a mulch, where it will rot and be taken down by the worms. A less direct form of green manuring is to grow a crop which is then left to rot on the compost heap.

In any normal rotation, a good deal of land will be left bare in the winter and nutriment in the soil will constantly be carried away by rain, or nitrogen will be given off into the air in the form of ammonia gas. But if a green manure crop is growing on the soil – even just a crop of weeds – fixed nitrogen is immediately taken up and held in organic form so that it is lost neither through rain nor to the atmosphere. Subsequently, the nitrogen is released for use by the following crop after the green manure crop or weed cover has rotted down. And an added benefit of keeping the land covered with a crop is that the crop will provide resistance to erosion by rain or wind.

It is unfortunate that the best crops for green manuring, the legumes (which fix nitrogen in their root nodules), tend not to grow well through cold winters. It is best to use crops which produce lush green plants which will rot quickly. If possible dig them into the ground when the plants are still young, preferably before they flower.

Of the common green manure crops, the following have specific values.

Mustard

This is much grown by gardeners in cool climates because it grows very quickly and thus does not use the ground too long. Mustard grows a good bulk. It seems likely that it suppresses eel worms which are bad for potatoes.

Tagetes minuta

Although it is a bit too tough for direct green manuring, *Tagetes minuta* makes a fine bulk of composting material. It is particularly effective against eel worm, and it will also suppress couch grass, ground elder, and other perennial weeds. It is best to start the crop off indoors, and then plant out a foot (30 cm) apart in the spring.

Comfrey

Since it is perennial, comfrey is not a true green manure, but it is a compost plant. It sends its roots down deep into the subsoil, bringing up all sorts of nutrients. In good conditions, it will grow an enormous amount of leaf in one year which will dry down to make one tenth of the weight of good compost. It is worth growing a patch of it so that you can cut the leaves every year, and either put them on the compost heap or bury

them green under your potatoes. Comfrey can also be used to make "comfrey tea" for feeding tomatoes (see p. 103).

Winter legumes

Winter vetch can be sown in late summer, after you have harvested the summer crops, and will grow until well into the winter and stand, if it is not too cold, until the spring when they can be dug in. Like all legumes, vetch is valuable because it creates fixed nitrogen.

Other legumes which will withstand mild winters are rough pea, sour clover, Persian clover, fen creek, crimson clover, bur clover, Austrian winter pea.

Summer legumes

Summer legumes are useful if you have a large garden, some of which you want to leave fallow through the summer. There is a wide variety of summer legumes, including sweet clover and lespe-deza, both of which are much used (the latter particularly in the south); red clover, particularly good for a cool temperate climate; crotalaria, which is good for poor sandy soil in southern climates; and cowpea, which grows almost anywhere in the summer. Annual lupines are best sown in a sowed bed and planted out in the early summer a foot (30 cm) apart. Alsike clover is a biennial and should be dug in during the first autumn. Alfalfa or lucerne, is a splendid crop which can put its roots down 40 feet (12 m). This means that it can really break up and aerate the soil, as well as bringing up nutrients from the subsoil to the surface. On a garden scale you should dig it in long before it reaches maturity.

The choice of green manure crops will probably seem bewildering. What I would recommend, if you have enough land to let some lie under green manure during the summer, is red clover. For a winter green manure I would recommend a mixture of rye, which grows well in winter, with vetch. Indeed a mixture of rye and vetch is good anywhere for land left fallow in the winter, since it increases soil fertility.

With the exception of *Tagetes minuta* and annual lupines, whose sowing directions I have already mentioned, green manure crops should be established simply by broadcasting seed sparsely on a prepared bed and then raking it in.

FERTILIZERS

In the nineteenth century, Justus von Liebig, a German chemist, made the discovery that plant growth depends on the presence of three main elements: nitrogen, phosphorus and potassium. The discovery, however, had little immediate effect on crop husbandry at a time when farmers and gardeners had the convenience of easily available horse manure, which contains all three elements. But when motor transport replaced the horse, things changed dramatically – and, from the gardener's point of view, detrimentally. For today, the legacy of von Liebig's discovery is the utterly simplistic view that all you need do is to dose your plants with chemical fertilizers containing nitrogen, phosphorus and potassium. The result of this has been that, although chemically-fertilized crops do grow lush, their quality tends to deteriorate and they begin over the years to lack resistance to pests and diseases. So the chemists cope with this new problem by inventing all sorts of pesticides, fungicides and bactericides. But of course they have to go on inventing them, because the pests and diseases quickly develop immunity to the poisons.

The good organic gardener doesn't need chemical fertilizers. I never use them, and my gardens produce extremely high yields of good quality crops and vegetables. As a growing number of gardeners are coming to realize, there are much better organic methods of ensuring your land has the right amount of nitrogen, phosphorus and potassium as well as the minor, or "trace" elements.

Nitrogen

Of the three major elements, nitrogen has a more dramatic effect on crop yields than the others. But before plants can use it, it has to be fixed, not free (as it is in the atmosphere). Nitrogen can be fixed chemically in a nitrate but there are four things wrong with this. First, it is a very expensive process since it requires an enormous expenditure of power, and the price of nitrogen goes up every time there is a rise in the price of oil. Second, chemically-fixed nitrogen causes too lush a growth and greatly weakens the resistance of plants to pests, diseases and winter frosts. Third, it has been conclusively proved that excessive use of chemically-fixed nitrogen lowers the quality of plants as it increases the yield. Finally, and this is the most important point, nitrogen is already being fixed constantly from the air in organic soils by nitrogen-fixing bacteria. If you add chemically fixed nitrogen you do these bacteria out of a job

and they fade away. So you destroy the soil's capacity to fix its own nitrogen and, instead of getting it free, have to pay for it.

Thus, I would advise the gardener to apply nitrogen only in bulky organic form: as manure; as compost; as leguminous green manure; or as the residue of leguminous plants (which fix their own nitrogen) from the compost heap (where it is legitimate to use high-nitrogen matter, such as fish meal or blood meal, to activate the heap and so release the plant foods in the composting material).

You can apply nitrogen in concentrated organic form such as fish meal, blood meal, seaweed meal, dried sewage sludge or chicken manure, but do this only as an emergency measure as a tonic for a crop that desperately needs it. I am thinking here principally of *brassica* plants that have been hit by cabbage root fly and need something to get them over the bad period before they put out more roots and get a grip on life again.

The amount of fertilizer needed to correct nitrogen deficiency isn't critical. If you use cow manure, I would suggest about one pound (0.5 kg) per square foot (900 sq cm). Half this amount of poultry manure would be right; and with dried poultry manure, say, a fifth of the amount. These dressings will also improve the phosphorus and potassium content of your soil.

Phosphorus

If your soil is deficient in phosphorus, then, again, you could use a quick-acting chemical additive like superphosphate. But the organic gardener will use simple cow manure, which contains five pounds (2.3 kg) of phosphoric acid per ton. If you cannot get hold of enough cow manure, and a test shows that your garden is deficient in phosphorus, use ground rock phosphate — which may act slowly but goes on acting over many years — bone meal, dried blood, sewage sludge or cottonseed meal. (The firms which supply these phosphate additives have to provide an analysis with them, so you'll be able to compare how much phosphorus you get for your money.) And remember that phosphate-rich organic additives have other organic side benefits. Incidentally, if you live near a steel industry center, basic slag is an excellent phosphatic mixture.

If you need to correct a phosphate deficiency in your soil, don't worry about putting too much phosphate-rich dressing on: it won't harm the plants, and it will go on doing good for many years. I would suggest about three pounds (1.4 kg) per hundred square feet (9.3 sq m).

Potassium

The third element of the trio is potassium or potash, which is specially necessary for root crops, though it improves the quality and stamina of all plants. Potassium is present in most soils, and clay usually has an adequate amount, but if you find you have a potassium deficiency then you can correct this without resorting to expensively-mined potash. Wood ash is specially rich in potassium, but farmyard manure or good compost has it as well as the other vital elements. Greensand, greensand marl and granite dust are excellent sources of potassium and are readily available. As with phosphatic fertilizer, three pounds (1.4 kg) of dressing per hundred square feet (9.3 sq m) is about right.

Trace elements

In addition to nitrogen, phosphorus and potassium, you may find your soil is deficient in what are called "trace elements": that is, elements which are essential in soil, though present only in minute quantities. These include magnesium, zinc, sulfur, manganese, molybdenum and boron.

A well-composted soil is unlikely to be deficient in any of the trace elements, and, in general, a good dose of animal manure, sewage sludge, or seaweed compost should cure any symptoms of deficiency. But there are specific remedies for the lack of one or another of the trace elements. For magnesium deficiency, for instance, use epsom salts: one ounce (28 g) dissolved in 1.2 gallons (4.5 l) of water per square yard (0.8 sq m). For sulfur deficiency, use sulfate of ammonia. For manganese deficiency, spray one ounce (28 g) of manganese sulfate dissolved in five pints (3 l) of water over 30 square yards. For molybdenum deficiency, use a few ounces of sodium molybdate per acre. For boron deficiency, use one ounce (28 g) of borax dissolved in 2.4 gallons (9 l) of water over 20 square yards (17 sq m).

Soil testing

There are a number of soil-testing "kits" on the market which will adequately show up any deficiencies in nitrogen, phosphorus, potassium and the trace elements. But many of them only give you the amount of inorganic fertilizer which the makers consider you should add to correct the deficiency. Otherwise, consult your County Agent, or write to your State Extension Service. But probably the simplest way is to check your plants for symptoms of element deficiencies (see following table).

Symptoms of soil deficiency

Symptom	Element deficiency
Leaves appear chlorotic (pale green or yellow color); older leaves turn yellow at the tips; leaf margins remain green but yellowing occurs down the midribs.	Nitrogen
Plants are stunted and dark green in color; older leaves develop a purple hue.	Phosphorus
Unnatural shortening of plant internodes (areas of stem between the nodes, or swellings in the case of grasses and sweet corn); leaf tips turn yellow and appear scorched.	Potassium
Older leaves turn yellow and then develop whitish stripes between the leaf veins.	Magnesium
New leaves develop whitish areas at the base on each side of the midrib; internodes appear shortened.	Zinc
Plants develop general chlorosis of the leaves	Sulfur
Mottled effect on new leaves; in apples, a spotty chlorosis appears between the lateral leaf veins, and the chlorotic areas die, leaving holes.	Manganese
Brassica plants particularly show cupping, an inward curling of the leaves, and the leaf tips become wrinkled.	Molybdenum
Root crops, especially turnips and rutabagas, turn gray and mushy at their centers.	Boron

Lime

There is one more important element in soil — calcium, or, in gardening terms, lime. Lime is, in a way, the key element, because if the lime content of your soil is not right then this is likely to affect the other elements.

Soil varies considerably in what chemists call its pH value, from extreme acidity to extreme alkalinity (see the table overleaf giving the range of soil pH values). And it is within this range that you may need to add — or withhold — lime in order to get the proper balance for plant growth.

The specific action of lime is to neutralize soil acidity. But as well as this, it has a number of

beneficial effects. For instance, lime improves the structure of clay soils by causing the minute soil particles to “flocculate”, or stick together in crumbs, so that the soil becomes softer and easier to work. (Clay is generally acid, and this gives rise to deflocculation, where the soil becomes hard and impervious to water and air.)

Lime will also reduce the action of denitrifying bacteria, and thus save loss of nitrogen from the soil. It also releases phosphorus and potassium which get locked up in acid soils. Where there is an excess of some of the trace elements, especially manganese, lime renders them insoluble, so they can't do the plants any harm. Finally, lime reduces the soil's take-up of strontium 90 — which, with the proliferation of nuclear power stations, may well become a serious problem for gardeners.

But you need to be careful in applying lime, because too much of it is as bad as too little. If you overlime, you may cause deficiencies in some of the other soil elements, particularly phosphorus, manganese, zinc and boron.

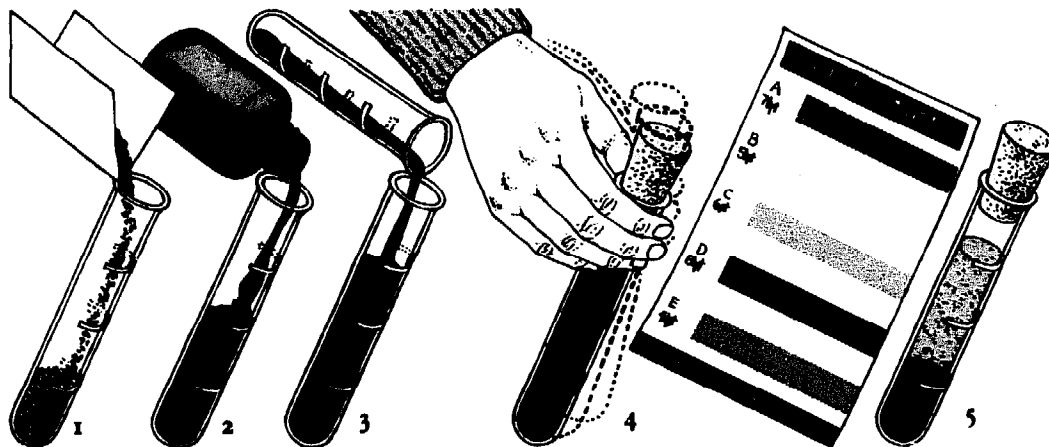
What you need to do first is to test your soil for its pH value. Simple pH testing kits can be bought at most gardening shops. And I would recommend fairly regular testing in order to check that the pH value is kept constant.

If you find you need to add lime to neutralize acidity (the optimum level is between pH 6.5 and 7), then you can get it in various forms. I prefer ground limestone (dolomitic limestone is best if you can get it), but slaked lime (limestone which has been burnt and then slaked with water) is also commonly used. Chalk, too, is simply a soft limestone, and sea sand from certain coastal areas is rich in lime, which it gets from the shells of molluscs. As a rule, it is just a matter of getting what is easily available, and lime isn't an expensive item. If you are really stuck, you could buy lime used for whitewash from a do-it-yourself store.

TESTING SOIL FOR pH

The simplest soil testing kits consist of two test tubes, a bottle of solution and a colored chart.

- 1 Fill one test tube a quarter full of soil.
- 2 Fill the other tube half full of solution.
- 3 Pour the solution into the tube with the soil in it.
- 4 Cork it up and shake it.
- 5 Allow the soil to settle, and compare the color in the tube with the colors on the chart.



How much lime you need to dress your soil with depends on the soil's pH value, and on what you want to grow. Five pounds (2.3 kg) of lime spread over a hundred square feet (9.3 sq m) will increase the pH value by 75 percent. If your soil is very acid, I would advise using this amount about every five years. Otherwise, if your soil has a pH value of, say, 5, and you want to neutralize it at 7, then dress it with two pounds (0.9 kg) of lime per hundred square feet (9.3 sq m). However much you need, avoid liming the soil at the same time as you add manure. It is best to leave a six-month gap. Generally, I apply lime before planting crops which particularly need it—the legumes, for instance.

Range of soil pH values

pH value	Level of acidity and typical location	Typical plants
3.5-4	Extremely acid. Rare but it occasionally occurs in forest humus areas of the north-eastern states	None
4-4.5	Still extremely acid. In humid forest areas, or sometimes where there is wet, peaty soil	None
4.5-5	Acid. Mainly in cold damp areas	Blueberries, cranberries
5-5.5	Fairly acid. Typical of unlimed soil in very wet climates	Potatoes, tomatoes, raspberries, strawberries, rye
5.5-6	Slightly acid. Moderate climates with high rainfall	Grasses
6-6.5	Neutral. Moderate climates without too much rain	Most garden crops
6.5-7.5	Neutral. Hot, dry climates	Most garden crops, but not potatoes or tomatoes
7.5-8	Extremely alkaline. Semi-desert areas of the western states	None

Routine fertilizing

After you have corrected specific deficiencies in your soil by direct dressing of the ground, I would advise you to add further regular but small amounts of phosphate¹ and potassium fertilizers to your compost heap. Recent research, principally in Russia, has shown that phosphates certainly, and probably potash too, give better results when mixed with compost (or manure) since the acids in the compost help to release the elements. Also, by adding a phosphatic mixture to the compost or manure heap you help to fix nitrogen that would otherwise blow away as nitrogen gas. My suggestion is that you should estimate the area of your garden and add about a quarter of a pound

(114 g) each of phosphatic and potassium fertilizers to your compost heap for every hundred square feet (9.3 sq m) of garden. Just buy the appropriate amount of the fertilizers every year, keep them in your garden shed, and sprinkle them into the compost heap as you build it, so that you get an even distribution throughout.

The final point I want to emphasize about fertilizers, though, is that virtually any organic manure will supply all the elements essential to 'soil' (except, perhaps, lime). In fact, animal manures contain a great variety of chemical elements. If you keep livestock of any kind in your garden (animals or birds) you should never have any problem caused by lack of fertilizer. But remember that all organic manures should first go through the compost heap. Even human manure is excellent, so long as it is put into the compost heap and buried under fresh greenstuff or other organic material. The heat of the compost, and the general bacterial activity, will destroy all pathogens, or harmful organisms in the manure long before you dig it into the soil. In my view, it's just a puritan prejudice that you can't use good, honest human manure — and there's no supply problem.

Elements in organic fertilizers (by percentage)

	Nitrogen	Phosphoric Acid	Potash
Bone meal	2-4	22-25	—
Fish meal	7-8	4-8	—
Dried blood	13.0	0.8	—
Hoof and horn	13-14	2.0	—
Fresh seaweed	0.6	0.2	2.0
Bracken (dried)	1.4	0.2	0.1
(green)	2.0	0.2	2.8
Tea leaves	4.2	0.6	0.4
Coffee grounds	2.1	0.3	0.3
Meadow hay	1.5	0.6	2.0
Straw	0.4	0.2	0.8
Compost from old mushroom bed	0.8	0.6	0.7
Wood ash (not rained on)	—	1.5	7.0
Soot	5-11	1.1	0.4
Farmyard manure	0.5	0.1	0.5
Horse manure	0.7	0.3	0.6
Poultry manure	1.5	1.2	0.7
Rabbit manure	2.4	1.4	0.6
Pigeon manure	5.8	2.1	1.8

Propagation

When a gardener is said to have "green fingers", all that's meant is that he has the gift of sympathy for living plants. And where green fingers really show up is in the various propagating processes. Put a tiny seed in concrete-like clay and you'll suffocate it. Try and strike a stem in wet mud and it too will die. Let your seeds and cuttings dry out too much – or keep them too wet and short of air – and you'll undoubtedly kill them. But if you think of your plants as living things, and treat them with the same sympathy you would any living thing, then there is no reason why you should not have a successful garden.

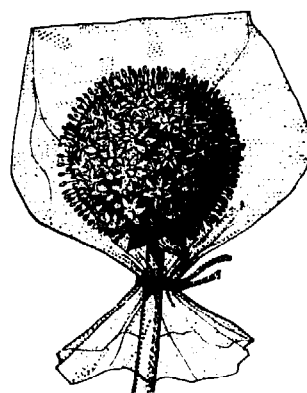
Saving seed

Buying seed is a lot cheaper than buying vegetables of course, but the true self-sufficient gardener will grow most of his own seed himself. If you grow a few more plants than you want for eating, and let the extra ones go to seed, then you'll be able to collect the seed and go on sowing it year after year.

If you are saving your own seed, it's best to "rogue" your plants – in other words, pull out any that aren't true to type (unless of course they're better than type) – and use only the very best ones. It's only because for thousands of years gardeners have planted the best seed that we now have the plants we do instead of the weeds they were originally bred from.

Remember too, that since seed takes a long time to ripen, it's best to give the plants which are growing seed for you a head start by getting them off as early as possible in the year – even if you have to do it under glass. Warm climate plants which are grown in cold climates (pole beans, for instance) have difficulty in ripening their seeds effectively in short summers unless they have help.

Seed of biennials The problem with saving the seeds of biennials is that normally they make growth in their first year and seed in the next. Some of them "bolt" of course – that is, they shoot upwards and seed in their first year – but resist the temptation to gather seed from these. Bolting carrots – like bolting spouses – are no good. Beets, carrots, parsnips, onions, turnips and rutabagas are best lifted in their first autumn, stored where it's cool, and replanted in late winter or early spring, when they will take root again, shoot up and go to seed. Leeks I generally just leave in the ground: they shoot up taller than I am and make gorgeous round flower-heads which then go to seed. You can leave onions out all winter too, but it is safer to store them inside and



COLLECTING ONION SEED

Onion seed must be collected in the second year of the plant's growth. It is best to lift the onion plants in their first autumn and keep them in pots indoors until spring. When the flowers appear, tie plastic bags round them. The seed will fall into this instead of blowing away in the wind.

plant them out in the spring. Salsify and scorzonera can be allowed to grow on for their second year and then they'll seed.

Brassica seed Brassica seed, however, is far better bought; it costs very little anyway. For one thing, all brassica plants – together with that noisome weed charlock – can interbreed and so you don't know what the genetic gambler is going to pull out of the bag. For another thing, growing seed from these plants means leaving them in the ground for a very long time where they take up room and are liable to suffer from clubroot.

Tomato seed Tomatoes are easy to save for seed. Label a few fruits on your best (and earliest) greenhouse plants, and let them get fully ripe. Pick them, cut them open and wash the seed out of the pulp. Then lay the washed seed on newspaper in a warm place to dry.

Cucumber seed Cucumbers are more tricky, for you must help them to mate. Take a male flower (the one without a miniature cucumber behind it), cut off its petals so as to expose the stamen, and, with a small paint brush, brush the pollen into the middle of some fully-open female flowers. The female flowers stay fully open and receptive for two or three days, so, to make absolutely sure, brush pollen into them every day that they are like this. When the cucumbers are fully ripened, remove, wash, and dry the seed as with tomatoes.

Squash tribe seed Squashes, pumpkins, melons and other gourds don't always have to be artificially pollinated. I have often just planted the seeds of squash tribe vegetables that I have bought at the supermarket and they have grown satisfactorily. It is safer to buy seeds for these vegetables but if you want to try saving seed, leave the fruits in a warm place and let them get as ripe as possible – even to the point when they begin to rot – before extracting the seed.

Lettuce seed Lettuce is easy, but make sure you select the best specimens to breed from – and that

does not mean the earliest ones to form seed-heads. Leave a row of good lettuces for seed, harvesting the smaller ones to eat, then rogue the ones that bolt first. Take your seed from a large and late-flowering plant; watch it pretty carefully, though, to catch the seed before the wind blows it all away. One lettuce plant will very probably keep you in seed for years.

Pelleted seed If you decide to buy seed, it's worth considering pelleted seed. This is simply seed that has been coated with some nutrient substance, so that each individual seed is inside a little pellet of nourishment. This feeds the seed when it is wetted and starts to grow. The pellets make every seed the same size, which means you can sow such seed very easily in a seed drill. But even if you do not use a seed drill, pelleted seed has the advantage that very small seeds can be sprinkled more thinly on the ground (or on sowing compost) than would otherwise be possible. Seed tapes also make it easy to handle seeds and reduce the time spent thinning. However, both are expensive.

Forcing seed indoors

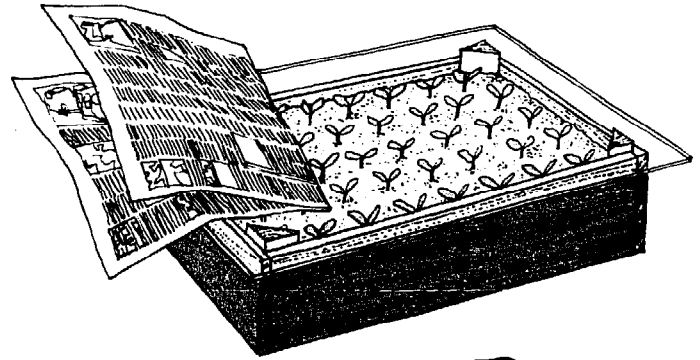
If you want to get out-of-season crops, or grow crops outside their normal climate zones, you'll need to force your seeds indoors. There's nothing wrong with forcing seed in my view: it's fun, you get more to eat and a more interesting diet.

Propagators Seed must be forced in a propagator; the basic idea is to keep the temperature up and constant at about 70°F (21°C) and the humidity at the right level. The simplest form of propagator is just a shallow seed box covered with a sheet of glass with a folded newspaper laid on top. This is quite adequate, but it is better to have a hinged lid (preferably of glass) with some device to keep the temperature up, and a thermometer to check it. You can make one of these yourself, or you can buy propagators of varying degrees of complexity.

To keep your propagator moist, either use a vaporizer for making mist, or if you are using an ordinary seed box, lower it into water – about halfway up – for long enough to let the water soak up from below. Using a mist propagator is a good idea anyway, because if you douse tiny seeds you may wash them away.

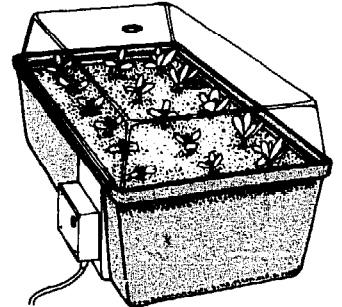
Tiny seeds must not be buried beneath the seed compost. Sprinkle them sparsely on top and cover them with a layer of finely-sifted sand. Larger seeds should be covered with compost to a depth of about three times their diameter.

As soon as the seedlings begin to show, uncover the propagator to give the seedlings light,



PROPAGATORS

You can make a propagator by filling a seed box with seed compost, covering it over with glass and laying newspaper on top of this. In a warm place this will work well. Alternatively, you can buy ready-made electrically heated propagators, with or without thermostats.



and move it into progressively cooler and drier conditions until they are well grown (this hardens them off for planting outdoors). Don't water the seedlings until they are really well established, and then start sprinkling from above. If you use seed composts that are inert – that is, without nutrients – you should feed the seedlings with manure water (see p. 103).

Pricking out

When the seedlings are established they should be pricked out – that is, replanted with more space between them (use a pointed stick to do this). For vegetables that don't like being transplanted, I would recommend sowing the seed in peat pots rather than directly into the propagator. The peat pots can then be placed in the propagator. Later, when you plant them out, the peat rots down and the expanding roots push through.

Seed and potting composts

Most gardeners buy prepackaged seed and potting composts from the local garden shop, and this is the best thing to do unless you have the time to make your own. When you buy your compost, examine it carefully. It should be light and porous, almost fluffy in texture.

You can make your own composts, starting with the three basic ingredients, loam, peat and sand. You get loam by first cutting sods about four inches (10 cm) thick from a clean, well-drained pasture (try to find one with a medium-clay soil and a pH of 6.5 or less). Water the sods if they are dry, and then, in the early summer,

start stacking them grass-side down. Make the stack about five feet (1.5 m) square and five feet high, and, as you build, put in alternate layers of strawy manure, mixed with ground chalk or limestone – you'll need about five pounds (2.5 kg) of one or other of these throughout the stack. When the stack is finished, cover it to keep the rain off, and in about six months the loam will have decomposed. Just cut it up and shred it with a spade. The loam now has to be sterilized, either by steam at a temperature of 212°F (100°C) or in an oven at 170°F (77°C).

The best peat to use is either sphagnum moss peat or sedge peat. (Unless you're near a peat bog, you'll probably have to buy it.) The sand should be coarse and sharp, and it's best to use river sand.

To make seed compost, mix two parts of loam to one part each of peat and sand, and add about two pounds (0.9 kg) of superphosphate per cubic yard (0.7 cu m). To make potting compost, mix seven parts of loam to three parts of peat and two parts of sand. To this you should add either some very well-rotted compost from your compost heap, or alternatively about five pounds (2.3 kg) per cubic yard (0.7 cu m) of a proprietary brand compost additive. A good additive contains two parts by weight of hoof and horn meal to two parts of superphosphate and one part of sulfate of potash.

An excellent potting compost known as the Cornell mix is widely used. To make this you'll need two gallons (9 l) each of vermiculite and shredded peat moss, to which you add two level tablespoons each of superphosphate and ground limestone, and eight heaped tablespoons of steamed bone meal or an equivalent amount of cow manure.

In general, of course, it's quite possible to grow many plants without seed or potting composts at all, although they are definitely a good idea for celery and tomato seeds.

Finally, remember that when you've finished with the seed and potting compost you can put it all into your ground to increase fertility.

Seed-beds and holding-beds

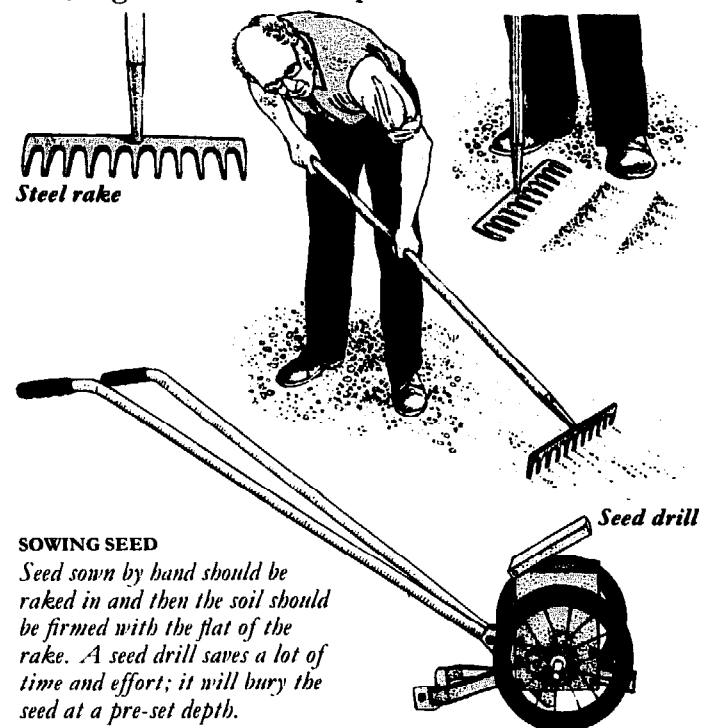
Often you will find that the land in which you want to sow seeds is already occupied by something else, so it may be necessary sometimes to sow first in a seed-bed, and transfer the seedlings later to a larger holding-bed. In fact, provided the plants are eventually planted out with care, most of them actually seem to benefit from transplanting. The idea which has grown up lately that plants should never be moved is, in my view,

nonsense – as anyone who tries it will find out. In an average garden, the seed-bed can be quite small: say about a yard (90 cm) square. A yard row of seedlings is actually a considerable number of plants. Soil for the seed-bed should preferably be light, dry and well drained, with plenty of peat, compost or other organic material worked into it. I would advise raking in finely-rotted compost every year, and liming it lightly every two years to maintain a pH of between 6.5 and 7.

The holding-bed will obviously have to be bigger, since the seedlings you put in should be spaced about six inches (15 cm) apart. In general, treat the soil exactly as for the seed-bed, but here you must watch out for clubroot because your holding-bed will almost certainly contain *brassica*. Regular liming should prevent any build-up of the disease, and I'd also recommend rotating the holding-bed from time to time. There's no need to do this with the seed-bed if you put compost on every year.

Rollers If you're putting *brassica* plants and onions into the seed-bed or holding-bed, then the soil should be firm. A roller is the best solution here, and it saves time. But many gardeners get on perfectly well without one, and your feet are almost as good if you can learn that strange gardeners' dance which might be called the sideways tramping scuffle. Personally I would not put a roller very high on my list of essential gardening tools.

Rakes When you come to sow your seed in the bed, a good rake is indispensable since small seeds



need to be sown in fine tilth. The best type of rake is a strong steel one which is not too wide. There are cast aluminum rakes on the market which are cheaper, but after an hour of working fairly stony ground they begin to resemble old men's smiles before the invention of false teeth. The rake is in very frequent use in the garden, so don't begrudge investing in a good one.

Sowing seed To sow your seed, first fork over the surface lightly. Deep digging isn't necessary — in fact, keep the topsoil at the top. And only fork the bed over when the soil is dry. Next, rake the soil well, removing any stones, until it is reduced to a fine tilth. And, finally, score lines across the bed with the corner of a hoe before sprinkling seed on sparsely. Remember that small seeds should be sown shallowly: most *brassica* seeds, for example, need only about half an inch (1 cm) of soil or compost over them.

Seed drills You can of course use a seed drill, and in big gardens they do save time and your back. They save you the trouble of making a seed furrow and sprinkling seed from the corner of a packet, or one by one from your fingers; instead a seed drill lets you go along at walking pace simply pushing the drill into the soil where it automatically drops the seed. Don't forget though that you can't actually see the seed going in, so if the drill happens to get bunged up you may find you have embarrassing gaps when the plants come up.

A more sophisticated version of the seed drill is the precision drill, which works on the same principle but drops the seeds one by one at exactly the right distance apart. The advantage here is that you save an awful lot of seed, since otherwise, no matter how carefully you seem to be sowing it, you'll probably sow far too much and end up having to single the plants later. But precision drills are expensive, and many of them only work with pelleted seed anyway, so unless you're working on a market-garden scale I wouldn't advise getting one.

Covering seed When you've got the seeds in the ground, rake the soil again lightly and tamp it down with the back of the rake. You should sow only when the soil is dry enough not to stick to your shoes, but once the seed is in, it should be watered if no rain seems likely. Look out for flea beetles at this stage (see p. 124). A good shower of rain will disperse any which appear, but if they get bad and the weather's dry, dust the bed with derris or pyrethrum. And, above all, suffer no weeds to grow in the bed; any which come up should be pulled out immediately.

Vegetative propagation

It is a good idea to propagate fruit trees and perennial plants, such as soft fruit bushes and many of the herbs, by taking cuttings. In this way you get a mature plant much more quickly than you do from seed.

The principle of striking cuttings is in fact quite simple: cut a piece from an existing plant, put it into the ground, and it will strike new roots into the soil which eventually form a new plant. In fact a cutting from almost any part of a plant will form another plant if it is nurtured in the right environment. The new plant is, of course, produced vegetatively. It will be exactly like its parent plant because there is no sexual crossing — in fact it is the same plant.

Hardwood cuttings Hardwood cuttings are taken from hard sections of the plant or tree's stem or branches. They are generally taken in the fall from the new season's growth, although with some species, such as the fig and the olive, two or three-year-old wood can be used. Some hardwood cuttings should be buried in sand and stored indoors through the winter for planting out in spring. Others can be planted straight out in fall. Broadly this depends on the hardness of the species. (See the *Cultivation of Vegetables, Fruit and Herbs* pp.113-202). The most delicate hardwood cuttings are best planted in a mist propagator (see p. 92) if they are to thrive.

Softwood cuttings Softwood cuttings are cuttings taken from the tips of healthy young branches. Propagating from these is more risky, but it should work well with citrus trees and olives. Take cuttings in the spring and keep in a cold frame until they have rooted.

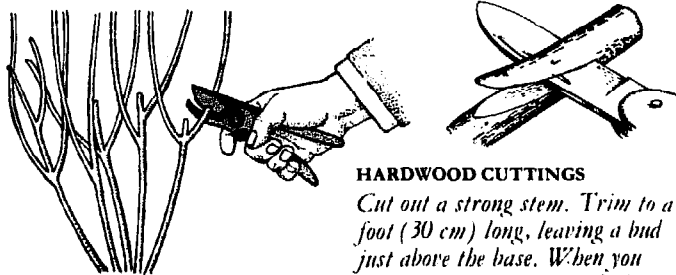
Both hardwood and softwood cuttings should be struck in moist, sandy ground, or in a special cutting compost made with three parts sand, one part leaf mold and one part loam.

Propagating from clumps To propagate clumping plants such as rhubarb, globe artichokes and shallots you should dig up the clumps and split them into smaller ones which you then plant separately.

Propagating from runners Plants which put out runners — either overground, like strawberries, or underground, like raspberries — can be multiplied by first severing the runner and the new plant that forms at its end from its parent, then digging it up and transplanting it.

Propagating from layers Gooseberries are good examples of the type of plant which can be multiplied by layers. You simply bend a branch over and peg it down to the ground. The branch then sends

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HARDWOOD CUTTINGS

Cut out a strong stem. Trim to a foot (30 cm) long, leaving a bud just above the base. When you plant, slice a chip from the base of the cutting and bury at least half the cutting in the ground.



SOFTWOOD CUTTINGS

Cut diagonally across the tip of a newly grown shoot leaving five or six pairs of leaves. Remove the two lowest pairs of leaves before planting.

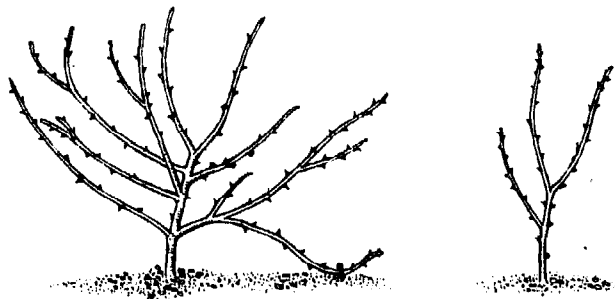
DIVIDING A CLUMP

Dig up the clump. Push in two forks back to back, and lever the clump apart between growing points before planting.



PEGGING LAYERS

Bend a branch and peg it to the ground. When it has rooted, cut through the original branch. Lift the new plant and move it to a new site.



SEVERING RUNNERS

It is easiest to bury a flowerpot under a runner before it roots.

Once it has rooted, cut through the runner, pull up the pot and replant in a new site.

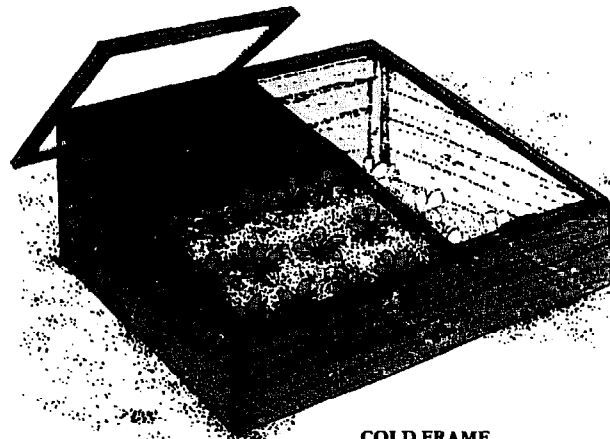
down roots and, when they are well established, the new plant can be separated, lifted and finally transplanted to its permanent position.

Protecting plants

Seedlings and young plants should be protected in the early spring until the weather is warm enough for planting out. There are a number of types of frames, cloches and mini-greenhouses used for this purpose, all made from glass or transparent plastic. But don't forget the humble window sill: a huge number of plants can be brought on in seed boxes placed on the window sill of the average house. Or, of course, you get the same effect by putting the seed boxes on the shelves of a heated greenhouse. However, with both these methods of protecting the plants, you must remember to give the plants a chance to harden off before planting them out. I recommend a period of about two weeks in which you progressively give the plants more air and less heat. It can be fatal to take plants from a warm place and immediately transplant them outside into a cold one.

Cold frames A cold frame is simply a wooden frame with a removable glass lid. It is particularly useful for hardening off your plants. Simply take the seed boxes from where they've been in the warmth and put them into the cold frame. Open the top of your cold frame on warm days and close it up at night.

Hot frames A hot frame is commonly used for forcing garden crops out of season. It is similar to a cold frame except that it contains manure or compost (or both) to raise the temperature. As a



COLD FRAME

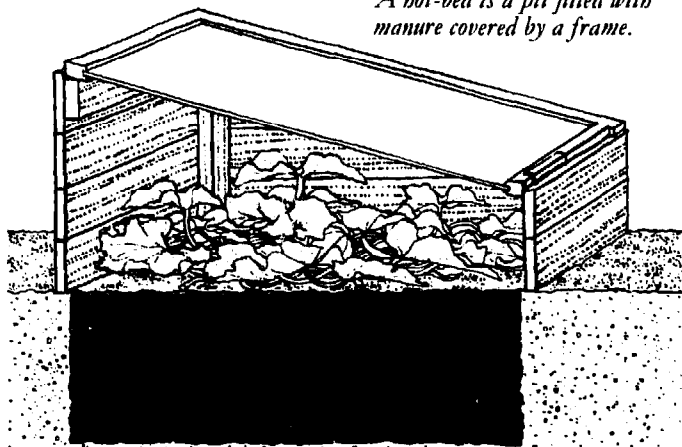
A cold frame is excellent for forcing lettuces and chicory in winter, hardening off seedlings in spring, as well as for growing vegetables that need warmth—cucumbers, peppers, eggplants—in winter.

base, I think it's best to use the same compost as for mushrooms (see p. 166). Put this in the frame, and cover it with a layer of six inches (15 cm) of good loam. Make the compost up in the frame rather than outside on a heap so that you get the full benefit of the heat it generates. And after one crop has been taken out, put the spent compost on the garden and mix up another lot for the hot frame.

Hot-beds Nowadays there are plenty of under-soil electrical heating systems designed for forcing on early plants in frames or greenhouses. These of course all cost money and energy, both to install and to maintain. The true self-sufficient gardener will be more interested in practicing the good old-fashioned hot-bed system of the old gardeners. It may seem a lot of work – and a lot of manure – but it is pleasant work and it gives you an appetite to eat what you grow by it. It is basically a more elaborate and more effective version of a hot frame.

HOT-BED

A hot-bed is a pit filled with manure covered by a frame.



Dig a pit 18 inches (45 cm) deep, either in your greenhouse or where you intend to build a frame outside. Seven days before you want to plant in it, fill the pit with a mixture of one part by volume of loam to two parts of fresh horse manure. Moisten this and tread it down. After three days turn it and, if it's dry, moisten it again. After four days "case" it: that is, add six inches (15 cm) of good rich soil. Meanwhile, if your pit is outdoors, erect a frame over it. If it is in your greenhouse, of course you don't need to bother.

When you plant or sow in the bed in spring it will provide a moderate and steady heat for as long as it takes to force your plants to maturity a month early. During the summer, you can get a good crop of tomatoes as a second crop, and after that winter lettuces, before you dig out the manure mixture and put it on the garden to increase fertility.

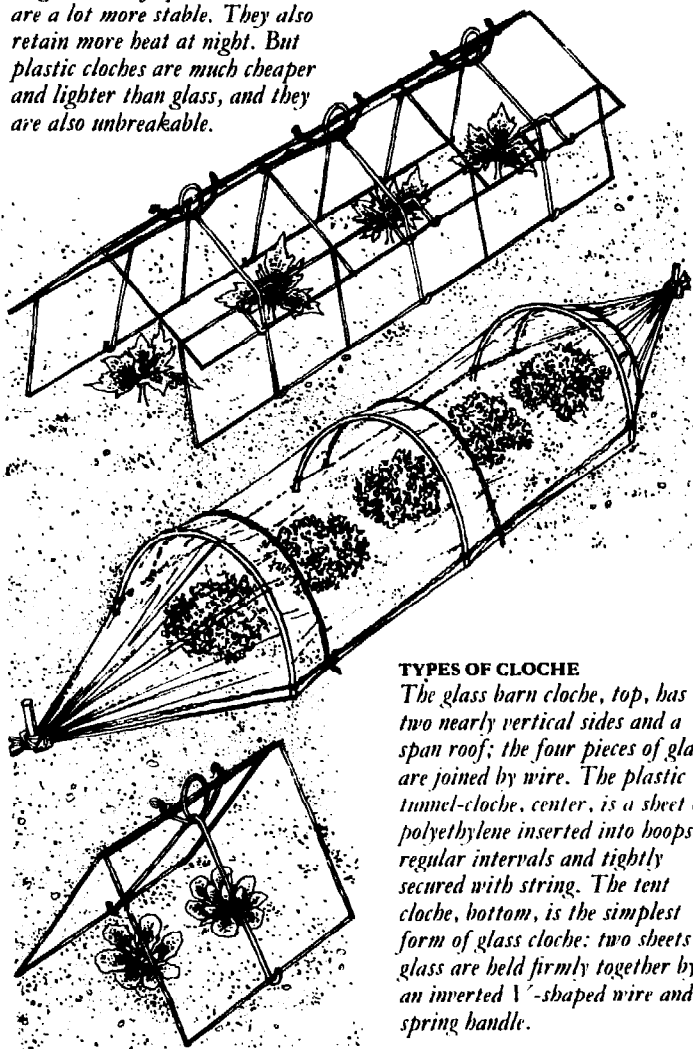
Cloches Cloches are used to bring on plants up to three weeks early in the spring, and I suggest you also use them all the year round on delicate or out-of-season plants, because in this way you will derive the most benefit from them.

A good sequence in my view is to have lettuces under your cloches in the winter, early potatoes in the early spring, tomatoes, eggplants and melons in the late spring, eggplants and cucumbers in the summer, and tomatoes again in the fall (take the tomatoes off their stakes and lay them flat on beds of straw under the cloches).

Cloches are made either from glass or transparent plastic. Personally I prefer plastic ones since I constantly break the glass ones, and of course they are much cheaper. You can get them made from either hard or soft plastic. In my view the soft plastic tunnels are the best. They are available at garden suppliers, together with wire supports,

GLASS OR PLASTIC CLOCHES?

Glass cloches last a good deal longer than soft plastic ones and are a lot more stable. They also retain more heat at night. But plastic cloches are much cheaper and lighter than glass, and they are also unbreakable.



TYPES OF CLOCHE

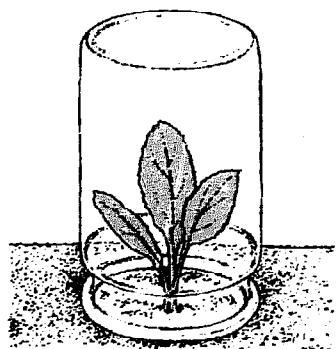
The glass barn cloche, top, has two nearly vertical sides and a span roof; the four pieces of glass are joined by wire. The plastic tunnel-cloche, center, is a sheet of polyethylene inserted into hoops at regular intervals and tightly secured with string. The tent cloche, bottom, is the simplest form of glass cloche: two sheets of glass are held firmly together by an inverted V-shaped wire and a spring handle.

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though you can use willow wands pushed into the ground at one end and then bent over. Plastic tunnels are simple to erect and fold away easily for storage.

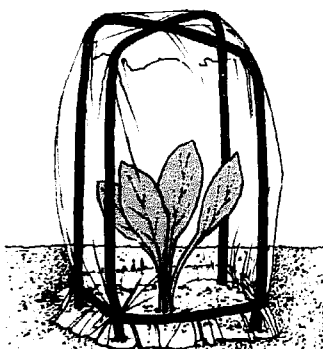
Mini-greenhouses The trouble with cloches is the difficulty of moving them for weeding, watering (although you can lay a trickle-pipe under them), keeping pests at bay and harvesting, so I'm very much in favor of a simple new idea, the mini-greenhouse. This can easily be tilted and propped up with sticks, or removed altogether. Instructions for building a mini-greenhouse are on p. 111.

Other forms of protection You can use inverted jam jars as mini mini-greenhouses until your seedlings get too big (but remember to allow a period for the seedlings to harden off). Transparent plastic bags inverted over bent wire coat-hangers or twigs can also serve the purpose. I've managed to get new potatoes earlier than anyone else



JAM JARS

Use inverted jam jars to give your seedlings some protection during the period when you are hardening them off.



PLASTIC BAGS

A plastic bag inverted over a bent wire coat-hanger will do the same job as a jam jar, even if it does not look as neat.

simply by laying a transparent plastic sheet over part of the potato bed. When the plants begin to grow, take off the sheet during the day and replace it at night. Keep putting the sheet on at night until all danger of frost is over. When the plants reach a height of six inches (15 cm), support the sheet on boxes or flowerpots.

Starter solutions

Plants may well suffer "shock" during transplanting. So it's a good idea to give them a tonic, called a "starter solution", each time you transplant.

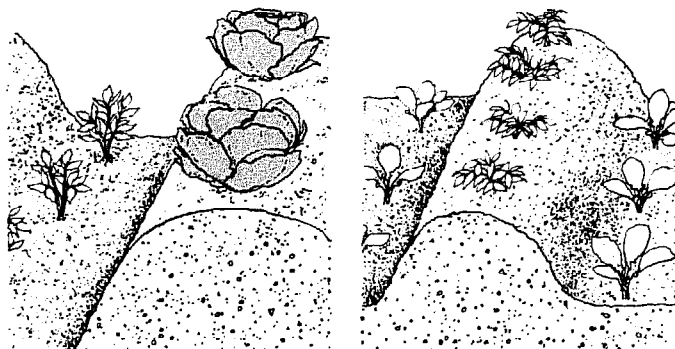
A good starter solution can be made by quarter-filling a barrel or drum with farmyard manure (halve the quantity if you're using chicken manure), and filling it up with water. Stir it well and let it soak for two or three days. When you're ready to use it, dilute it with water until it's

amber-colored and give each plant about a pint (0.6l) of the solution immediately after transplanting; the result can only be beneficial.

Intercropping

To get the heaviest cropping from your garden, it is a good idea to practice intercropping when sowing and planting. As a rule, a small garden should be cropped as heavily as possible, though of course you must avoid crowding plants – a vegetable slum is very unhealthy. While there are several different possibilities for intercropping, I would particularly suggest the following.

Broad beans can be sown with cabbages. Space the cabbages a little further apart than normal – say, 18 inches (45 cm) apart with about two feet (60 cm) between rows – and dib broad bean seeds into the row between the cabbages. The tall beans don't seem to interfere with the squat cabbages.



INTERCROPPING BETWEEN EARTHED-UP ROWS

After planting celery, you will have time to sow, grow and harvest lettuces along the ridges on each side of the celery trench before it is time to hill up the celery, left. In the same way, plant baby cabbages between rows of hilled-up main crop potatoes, right.

Winter brassica such as Brussels sprouts, broccoli or kale can be planted between the rows of main crop potatoes. Space the potato rows six inches (15 cm) further apart than you usually would. When the potatoes are ready, be sure to lift them with special care so as not to loosen the soil under the brassica plants, and then ridge up the soil against the brassica. Don't plant the brassica until the potatoes have already been ridged up.

Lettuces can be sown or planted along the ridges thrown up on each side of the celery trench after the celery has been planted. The lettuces will have been removed and eaten before you have to earth up the celery.

Pumpkin and melon seeds can be sown in with sweet corn. The crops seem to suit each other very well, and I've always got heavy yields by intercropping them.

Planting a tree

As with all transplanting, putting a tree in demands your sympathy for the young sapling's needs. It is quite a complicated process, and awkward if you try to do it alone, so it is a good idea to get a friend to help.

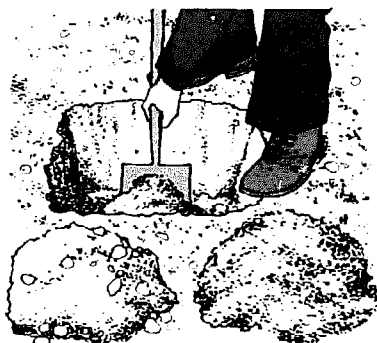
First, dig a hole at least twice as big as the root ball of the tree you want to plant. It's often suggested that you do this a few days before the tree is to go in, but I think this is a mistake: the surface soil in the hole is liable to harden into a pan. And remember when you dig, to put the topsoil in one pile and the subsoil in another. Put a layer of stones in the bottom of the hole to help with drainage. It is also a good idea to bury dead animals under newly planted trees. They provide the sapling with calcium and other useful elements released as it decomposes. Shovel some manure into the middle of the hole and cover it with a mound of topsoil. Now spread the roots of the

tree over the mound, cutting off any damaged ones. (In fact, a little root pruning is a good idea since it encourages the tree to put out new fibrous roots.) At this point you should drive a stout stake into the hole to support the tree. Get your friend to hold the tree upright as you do this.

Check that the tree is in at the proper depth: that is, the union between the scion and the root stock — the bulge or deformation at the bottom of the trunk — should be about six inches (15 cm) above the soil. In very dry climates, plant your tree six inches (15 cm) deeper. If the tree is too high, you'll have to make the hole deeper; if it's too low, increase the size of your mound of topsoil in the hole.

With your friend still holding the tree upright, replace the topsoil around the roots. (I recommend mixing the soil with compost in a ratio of three parts soil to one part compost.) Press the soil down firmly — but not so firmly that you tear

PLANTING A TREE



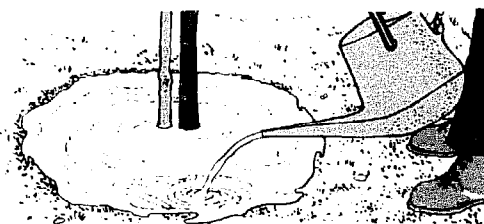
1 Dig a hole twice as big as the root ball of the tree to be planted. Put the topsoil in one pile, the subsoil in another.



2 Put a layer of stones in the bottom of the hole to help with drainage.



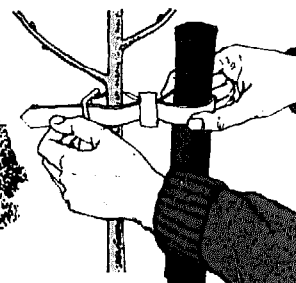
3 Spread the roots over a mound of manure and topsoil. Drive a stake in between the roots to support the tree, left. Check that the tree is at the proper depth by laying a plank across the hole and seeing where it touches the trunk.



4 Replace the topsoil, pressing it down gently but firmly. Then give the whole area a really good soaking.



5 Mulch the tree with eight inches (20 cm) of organic matter, but don't let the mulch quite touch the trunk.



6 Tie the tree to the stake with a stocking, or else you can use an adjustable strap.

the delicate root hairs — and make sure you leave no gaps. Try to arrange it so that the roots lie as they naturally want to. As you go on filling the hole, gently tread on the top of the soil to firm it around the roots.

Don't quite fill the hole; leave a depression in which water can stand, and then give it a really thorough soaking. Next, mulch the tree with about eight inches (20 cm) of organic matter such as old hay or straw, leaf-mold, manure or compost, without letting the mulch touch the trunk.

Once you've planted the tree, tie it to the stake, but be careful about this. Don't ever use thin hard string which will cut into the bark as the tree waves about. The best thing I've found for tying is an old stocking, but you can use webbing or leather collars, or wide ribbons plaited from sisal bailer twine. And watch the tree as it grows to make sure that it is not strangled.

Grafting

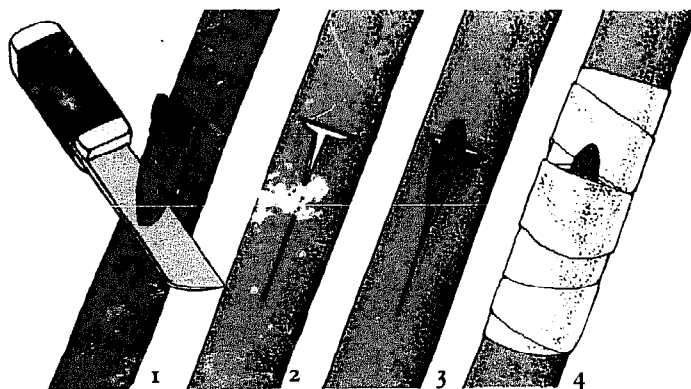
The purpose of grafting is to get a fruiting spur, or scion, of one tree to grow on to the root stock of another by bringing the cambium layers of each into contact with one another. (The cambium layer, which is the growing part of a tree, is the whitish area just under the bark.)

Most trees that are grown for their fruit are grafted, because the varieties that bear the best fruit are rarely the most hardy or vigorous varieties. Scions are therefore chosen principally for their fruit-bearing qualities, while root stocks are chosen for their strength and their tendency to produce a tree of a given size — dwarf, semi-dwarf, half-standard, standard and so on.

Since grafting is a non-sexual way of propagating plants, you must make sure that the scion is compatible with the root stock. Compatible pairings for different fruit trees are discussed in the Cultivation of Fruit chapter (pp. 167-190).

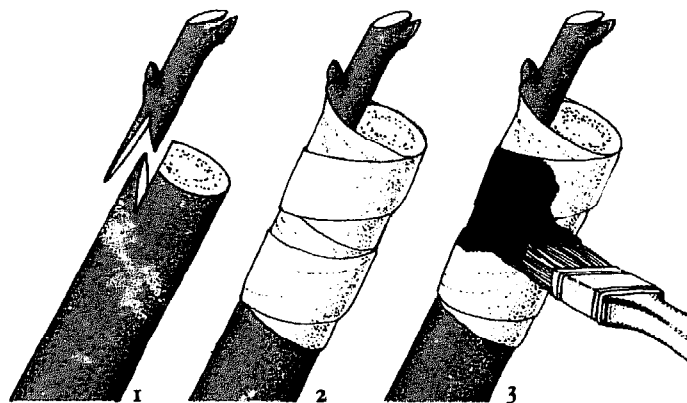
Grafting is an extremely old art, and several methods are now practiced. In my view the three most important are whip grafting, budding and cleft grafting. Whip grafting and budding are both methods of joining one-year-old scions to root stocks which have been planted out the previous year. In my experience both methods work very well and there is little or nothing to choose between them.

Cleft grafting is a way of resuscitating an old or sick tree. All the main branches should be sawn off to within a foot (30 cm) of where they join the trunk. A cleft graft should then be made in the end of each sawn-off branch.



BUDDING

1 Take the scion from the current season's growth, and cut out a shield-shaped chip containing one bud. 2 Cut the root stock off a foot (30 cm) above where the bud is to go. Make a T-shaped slit an eighth of an inch (0.5 cm) deep. 3 Peel back the flaps of the slit and insert the chip. 4 Bind the joint tightly with plastic tape, leaving the bud itself exposed.



WHIP GRAFTING

Do this in early spring, using a length of dormant one-year-old scion with four buds on it. Cut the root stock, planted the previous year, to within four inches (10 cm) of the ground. 1 Cut a notch in the top and a matching one at the base of the scion; fit the scion on to the root stock. 2 Bind the joint with either raffia or plastic tape. 3 Cover this and any other cut surfaces with grafting wax.



CLEFT GRAFTING

Saw through all the main branches a foot (30 cm) from where they join the trunk. 1 Take a sharp cleaver and use it on one of the sawn-off stumps. Cut two scions to a chisel shape at one end. 2 Force open the cleft and insert the two scions into this, lining up the cambium layer of scion and old wood. Let the cleft close up, thus clenching the scions into place. Pour hot wax all over to protect cut surfaces.

Care while Growing

Pruning trees

There are three basic reasons for pruning trees: first, to remove damaged, diseased and awkwardly placed branches; second, to shape the tree, for convenience of cultivation; and third to increase the crop and improve its quality.

Pruning unwanted wood In the first case, the general principles are to cut out any dead or unhealthy branches, and any which are overcrowded. You should also cut out any branches which point in toward the middle of the tree, and all suckers – the long, straight, vigorous shoots which will never bear any fruit. This heavy pruning should be done in late winter – though never when the temperature is lower than 20°F (–7°C). Make sure you cut out branches flush at the joints, and paint the wounds with one of the proprietary tree paints, or with any oil-based paint.

Pruning for shape Pruning and training for shape should for the most part also be done in the late winter, and it is important to establish the general shape, or “scaffold”, when the tree is still young. The scaffold is formed by the leaders, or main branches which spring from the trunk (sub-branches which grow from the leaders are called the laterals). It's best to keep the number of leaders which form the scaffold to a minimum.

How you prune will depend on the general shape you want. For example, if you want a branch to spread from the middle of the tree, cut it down to an outward-pointing bud. If you want to prevent the tree from spreading, cut it down to

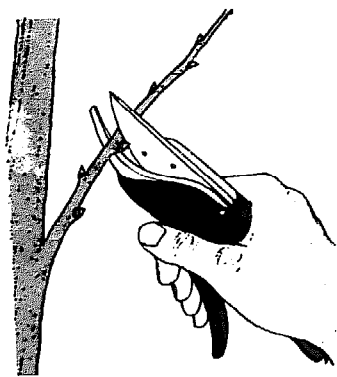
an upward-pointing bud and try to gather the tree together. In each case, it's important to cut to a quarter of an inch (1 cm) above the bud.

Until recently, experts have advocated the open-centered cup or goblet scaffold, where the spreading branches allow light to get to the middle of the tree. But, along with an increasing number of growers, I favor the basic “Christmas tree” shaped scaffold, called a pyramid or spindle. The reason for this is that the short branches of the pyramid shape are less likely to break if they have to carry a great weight of fruit, or of snow and ice, than the spreading branches of the goblet shape.

There are, however, several specific shapes which have advantages in certain circumstances. In small gardens where space is at a premium, I recommend shapes such as the dwarf pyramid, half-standard and bush, or, if you can grow against a wall or fence, the espalier, fan and cordon. Dwarf trees fruit earlier, but don't live as long as full-size ones, and they should be pruned very carefully. A dwarf pyramid must be cut back each spring so that it is no higher than you can reach. In late summer each year, shorten all branch leaders to six inches (15 cm), cutting to outward-pointing buds, and shorten laterals arising from the leaders to three inches (8 cm). Any shoots emerging from what is left of the laterals should be shortened to one inch (2½ cm). Do this pruning in the first week of August. In large gardens and orchards, full-size stock is better and less complicated to cultivate.

PRUNING TOOLS

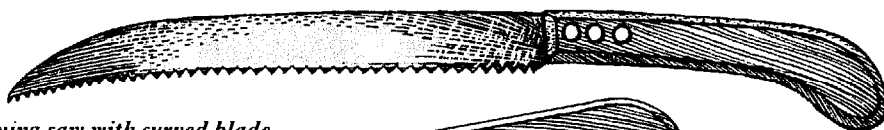
A pruning saw cuts through thick branches and tapers to a narrow end that will reach awkward places. For small branches use a pruner instead.



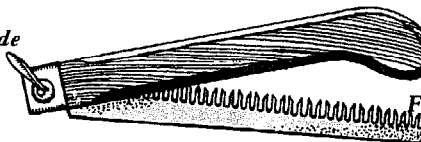
PRUNING TO A BUD

When you are pruning to a bud, for whatever reason, always cut to a quarter of an inch (1 cm) above the bud.

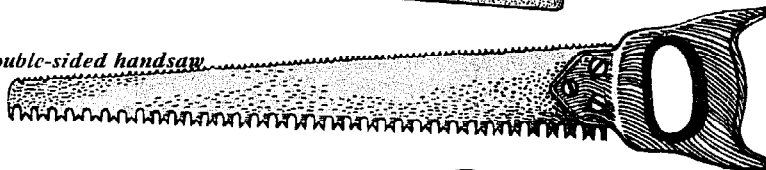
One-sided pruning saw with curved blade



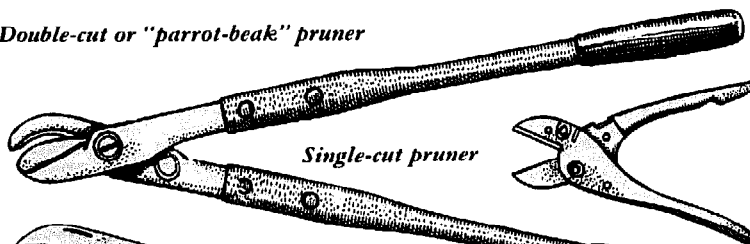
Folding saw



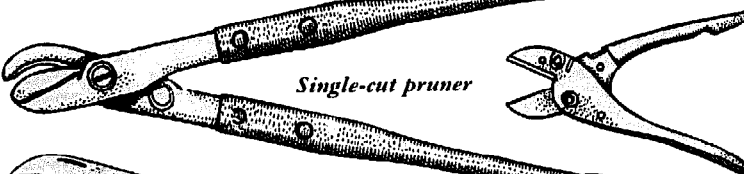
Double-sided handsaw



Double-cut or “parrot-beak” pruner



Single-cut pruner



Folding knife



Tree paint



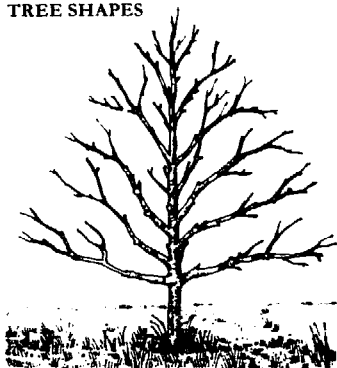
In general, winter pruning has the effect of encouraging tree growth. If a tree is growing weakly, then heavy pruning is advisable — as much as half the tree may well be pruned away. But cut very little off if a tree is growing vigorously, because you are liable to make it get straggly.

Pruning to encourage fruiting Summer pruning has the opposite effect from winter pruning: that is, it inhibits tree growth by encouraging the fruit spurs to develop rather than the lateral branches. Trimming back the new season's growth helps the

tree to fruit more heavily and earlier. If the fruit spurs are overcrowded, you should thin them out to allow the fruits to flourish. With summer pruning, never cut into old wood, and remember if you're cutting back to a bud to cut to a quarter of an inch (1 cm) above the bud.

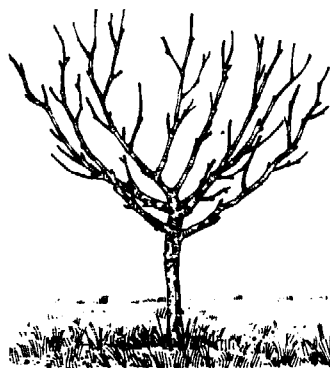
Pruning tip-bearers Certain varieties of apple and pear trees bear fruit at the tips of their branches. Prune these very little; just cut out surplus branches. If you tip the leaders and the laterals, the tree will cease to bear fruit altogether.

TREE SHAPES



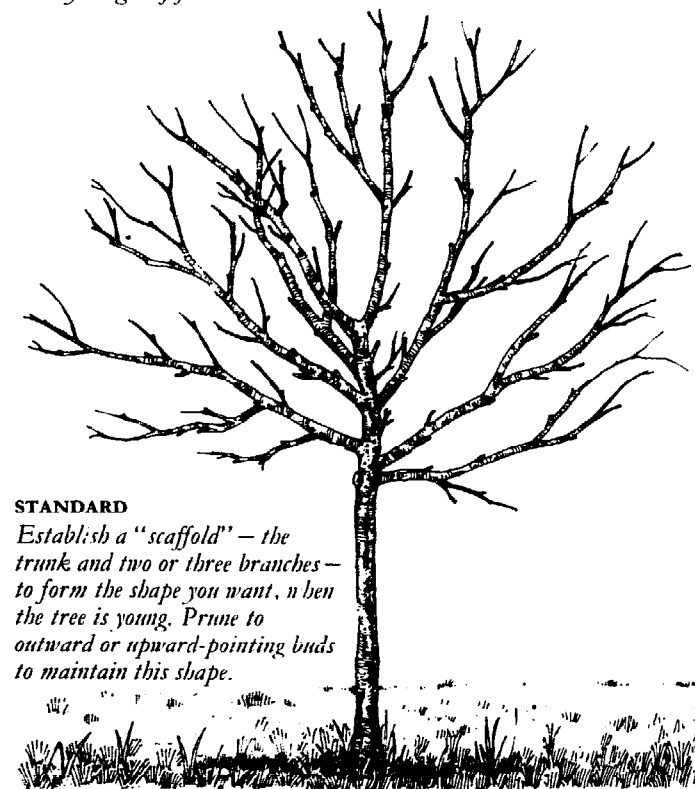
PYRAMID

This is the basic "Christmas tree" shape. It is increasingly favored over the goblet, because the side-shoots are kept very short and are less likely to break under a heavy weight of fruit or snow.



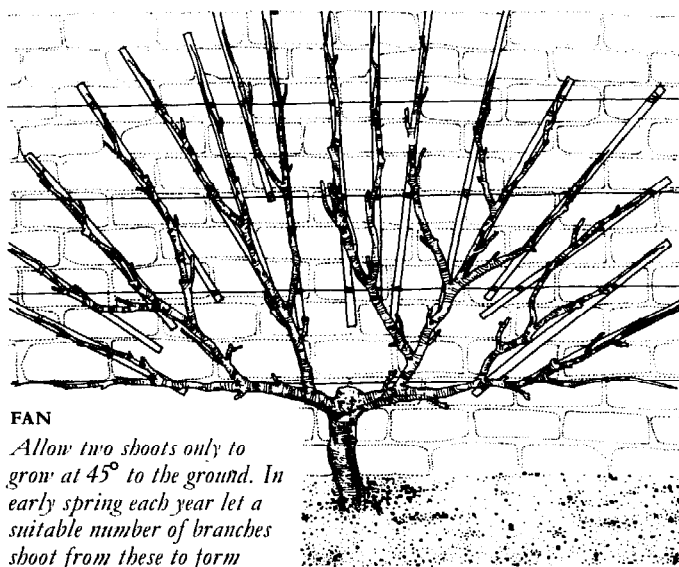
GOBLET

The shape of the tree resembles an open-centered cup or goblet; prune so that the arms are outward-spreading and the light is let into the middle of the tree.



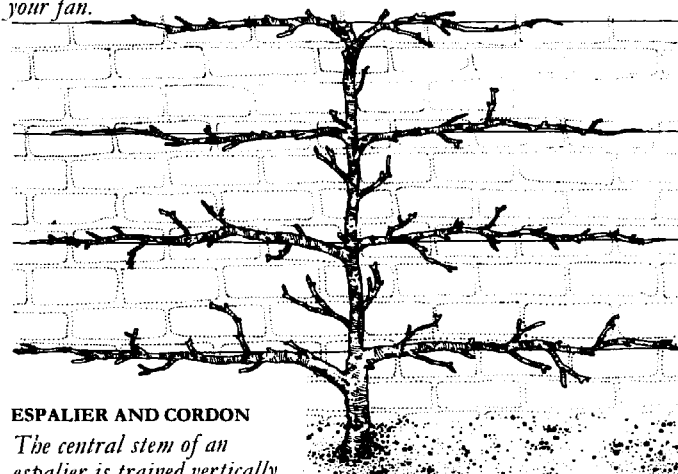
STANDARD

Establish a "scaffold" — the trunk and two or three branches — to form the shape you want, when the tree is young. Prune to outward or upward-pointing buds to maintain this shape.



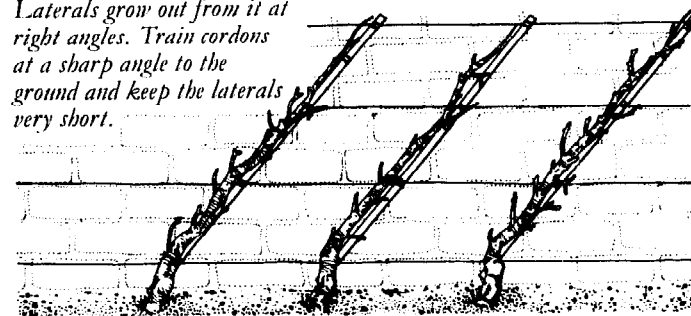
FAN

Allow two shoots only to grow at 45° to the ground. In early spring each year let a suitable number of branches shoot from these to form your fan.



ESPALIER AND CORDON

The central stem of an espalier is trained vertically. Laterals grow out from it at right angles. Train cordons at a sharp angle to the ground and keep the laterals very short.



Watering

Watering is necessary where rainfall is not sufficient to maintain good plant growth. In some areas, if you are very lucky, you need hardly water at all. In desert climates, however, you can grow practically nothing without frequent watering. But, even in wet climates it is often desirable to water young plants that are struggling to survive in dry periods. And there are few crops that do not show an increased yield when they are watered even in rainy climates. The metabolic process in a plant stops without water, for it is water that carries every useful element, all the way through the plant's body.

Seedlings and tiny plants should be watered little and often. Larger plants should be heavily watered but not so frequently. If there is enough water to sink deeply into the ground, it draws the roots of the plants deep too, to where there is more nourishment. An advantage of the deep bed method (see p. 106) is that it enables water to percolate deeper and quicker, thus encouraging strong root development.

Weeding

Weeds are in a strong ecological position: they were evolved by nature to occupy just the places where they are found. Crops, on the other hand, were evolved partly by mankind to provide good food and as a result their capacity for survival has been somewhat neglected. Don't believe people who tell you to tolerate weeds among your crops. No crop plants ever do their very best with competition from weeds.

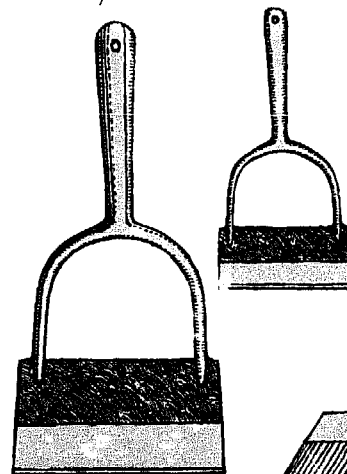
On the other hand, if you leave your ground fallow and don't plant a green manure crop to dig in and improve fertility, the weeds will actually do this for you. Let them grow under such circumstances — but *never* let them seed. "One year's seeding is seven years' weeding." Always dig weeds in before they seed.

Hoeing is the usual method of destroying weeds. The secret is to hoe the weeds before they declare themselves, or very soon afterwards. Keep using your hoe regularly. It takes little time to whip over a pretty bare piece of ground with a hoe, but a long time to hack through ground heavily infested with weeds.

Hoes There are several kinds of hoe; the two most common are the draw hoe and the push, or Dutch hoe. Personally, I've always preferred the draw hoe since I learned how to hoe from professional farmworkers — and you never see them tackling a field of turnips with push hoes. The

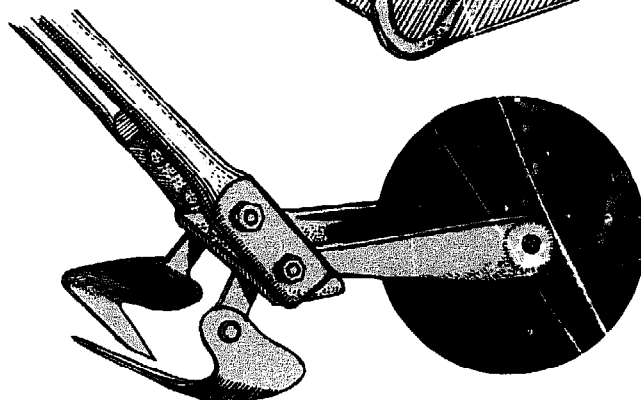
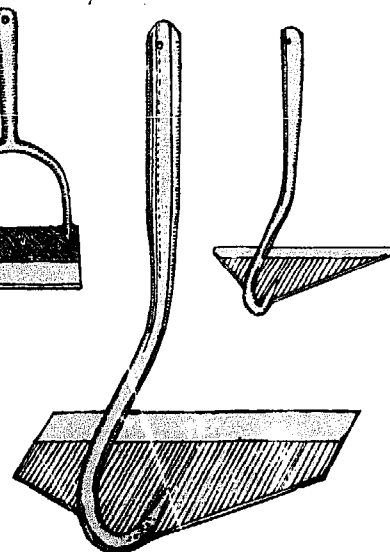
PUSH HOES

You can walk backward as you use a push hoe, thereby leaving the soil untrampled.



DRAW HOES

A small draw hoe is ideal for weeding. Use a large one to break up heavy clods.

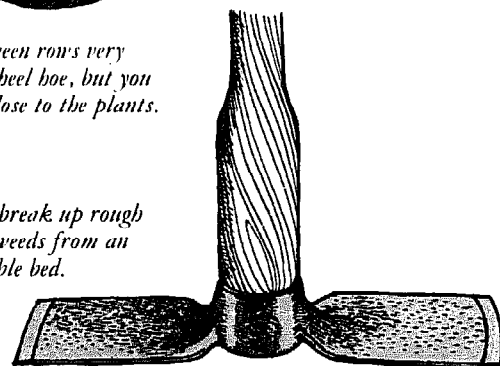


WHEEL HOE

You can hoe between rows very quickly with a wheel hoe, but you can't get really close to the plants.

MATTOCK

A mattock will break up rough ground, or clear weeds from an overgrown vegetable bed.



advantage claimed for the push hoe is that you can walk backward as you use it and so do not trample on ground you've just hoed, but I've never found this very significant. Recently, however, I've discovered that a push hoe is quite useful for working deep beds (see p. 106).

I recommend having two draw hoes: a good heavy one for chopping up unoccupied land and loosening the surface; and a light, sharp-cornered one for whipping out weeds which grow up between plants, or for singling out individual plants from a bunch.

There are also wheel hoes – some of them beautifully crafted tools with wooden shafts. The tool bars in fact take several kinds of attachment, such as plow blades (which I think are useless since they only scratch the surface), ridgers, raking spikes and harrows, as well as hoe blades. It's true that the wheel hoe can save time and effort, and it works quite well. I don't use a wheel hoe myself, however: for one thing, I find I can't get as close to plants with a wheel hoe as with a hand hoe.

Mattocks It's worth mentioning the mattock along with the hoe. As a sort of cross between a spade and a heavy hoe, it's good for breaking up the surface of rough ground. You can use it to make a seed-bed in a hurry, by going over the ground first with a mattock and then raking it. And if you return from a vacation to find your garden in a horrible mess, a light mattock is often a better tool to use than a hoe.

If weeds get too tall to hoe easily, you will just have to pull them. Either put them on the compost heap or leave them to rot on the ground as a mulch. If the weather is wet, the compost heap is better, because weeds left as a mulch may start rooting again.

Mulching

Mulching is the technique, much favoured by organic gardeners and farmers, of covering the soil with some organic material. The benefits of mulching are that it prevents the evaporation of soil moisture by stopping the wind from blowing directly on the soil and the sun from shining on it; it prevents weed growth; and ultimately the mulch rots down and adds to the humus content of the soil. Mulches are particularly useful under fruit trees, canes and bushes since they suppress weeds without damaging surface roots.

Many different organic materials can be used as a mulch. Weeds which have been hoed or pulled out of the ground and left between the crop plants (or just on bare ground) make a good mulch, and so does bracken, which has been dumped from elsewhere.

Wood chips, chopped bark or sawdust form a mulch which is excellent for suppressing weeds, but there is one danger: when wood products rot down, they draw nitrogen from the soil in order to feed the bacteria which break down the cellulose of the material. This results in a temporary but serious loss, and you have to add extra nitrogen to do the job. Wood products also take a long time to break down and add their nutrients to the soil.

Recently, I've come across the technique of using black polyethylene or other inorganic substances as a mulch. I am very much against this: it seems to me quite wrong to deprive the soil life of all sun and air. Ultimately, all soil life is killed by such practices and the soil turns to sterile dust.

Mulches are unfortunately fine homes for slugs and snails. So, if you are mulching, you must remember to take special precautions by trapping and killing them (see p. 104).

Top dressing

The practice of putting fertilizer on land once the crop has already started is known as top dressing. It is favored mainly by inorganic gardeners, who use highly soluble substances such as sulfate of ammonia. However, these substances are quickly leached out of the soil, so, if you do use them, it is best to apply them to the crop little and often.

In my view, really fertile soil doesn't need top dressing. The bacteria in the soil constantly break down organic substances and convert them into nitrogen which is made available to the plants. But certain very nitrogen-hungry crops, like *brassica*, do benefit from a top dressing of organic nitrogen (poultry manure, blood meal, fish meal), particularly if they have been checked by drought or root maggots for example. If phosphates, potash or trace elements are needed by the soil, they are better applied before the land is occupied by a crop than added to it at a later stage.

Manure water When you apply organic manure, compost, or green manure, to the land it gets moved about by worms and rots down, so it eventually becomes available to the crop. But if you want to give a quick boost to a particular crop, you may well consider the technique of soaking organic material in water, thus dissolving out some of its useful constituents, and then pouring the water on the crop. Do this by putting some manure or compost in a container such as an old oil drum. Fill this up with two to three times the quantity of water, and leave for a week or so. Manure watering is excellent when the fruit is forming on crops, such as tomatoes, cucumbers and the members of the squash tribe. But you can grow very good crops, consistently, outdoors, without resorting to such means, if you have built up a good organic fertility in your soil.

Comfrey tea When made into a tea in the same way as you make manure water (see above), comfrey leaves will provide a rich, crash dose of potash for those crops which particularly need this element.

Controlling Pests and Diseases

INSECT PESTS

I would never recommend using chemical insecticides. All life is one, and as a rule anything which destroys one form of life will damage another – perhaps even your own. There are, however, certain vegetable substances which will kill or deter harmful insects without damaging your crops or, most important, your insect predators. Remember: to kill a pest *and* its predator is very stupid. The pest will return and rage in an even more uncontrolled way.

Nicotine mixture If used with great discretion, a form of insecticide which is worthwhile is a solution made by boiling up four ounces (114 g) of cigarette ends in 1.2 gallons (4.5 l) of water. Strain and bottle this, and, when diluted in two parts of water, it's a good standby for getting rid of leaf miners, weevils and caterpillars. But it is a strong poison and may destroy some useful insects too. Don't leave the solution lying about, and always wash after using it.

Aphid deterrents Aphids do not need the same drastic treatment as most other insect pests. A squirt of water – especially soapy water – is usually enough to knock them to the ground and they won't be able to get back on to the plant again. If aphids are a particular nuisance, then I recommend you to spray with either derris or pyrethrum, both of which are obtainable at garden shops. Quassia, if you can get it, will kill aphids but not the helpful ladybird. As an aphid repellent rather than poison, a good idea is to boil up the leaves and stems of certain plants which aphids don't attack, such as marigolds, asters, chrysanthemums, anise, coriander and rhubarb. Make fairly strong solutions of these and experiment to see which is the most effective. Rotenone is the ground-up roots of the derris plant; it will discourage and control most chewing and sucking insects.

Fruit tree sprays For fruit trees, winter wash sprays of various kinds can be bought from garden suppliers, but it's easy to make your own. They are effective against aphids, red spider, mealybugs, scale insects and other pests which lay eggs on the tree bark. Mix 1.2 gallons (4.5 l) of light oil with two pounds (0.9 kg) of soft soap. Boil this up and pour it back and forth until it is very well mixed. Dilute this with 24 gallons (90 l) of water and spray the trees immediately.

Grease banding Grease bands prevent ants and other pests from crawling up tree trunks. How to make one is explained on p. 170. In general ants are useful in the garden, but they can be harmful when they "herd" aphids on to bushes and trees.

Wasp jars Wasps are harmful to certain ripe fruits, such as plums, and, if left unchecked, can ruin a crop of grapes. There are several wasp destroyers available which you put into the nest holes, but I find that to fill jars with sweet stuff like syrup, and hang them in the trees the wasps are attacking, is just as good. I admit, though, that you will need a lot of jars.

Millipede traps An effective device against millipedes – not centipedes, which are "goodies" – is a number of old cans punched full of holes and filled with potato peelings. Bury them in the soil; every few days, lift them out and put them under the tap to drown the millipedes.

Slug and snail control You can trap slugs by sinking some old plates or bowls in the ground and filling them with a little sugar or beer. But you'll need a lot of traps to keep the slugs down. Otherwise, try going out at night and sprinkling salt on every slug you find. The most effective way of killing snails is simply to step on them, but that always seems to me a pity – if you eat them, what was a curse becomes yet another harvest to add to all the rest.

ANIMAL PESTS

Mole deterrents I used to trap scores of moles, but I gave it up long ago. They lift up a row of seedlings now and again and mice sometimes travel along their burrows, but otherwise they don't do any real harm. So for most of the time I just let them burrow away.

During droughts, however, moles can be a pest when they tunnel along potato ridges where the soil is softer and full of worms. Row after row of potatoes can get lifted. A plant called caperspurge is supposed to repel moles, though the only time I ever tried it the moles just heaved it up. Alternatively, bury some empty bottles in the ground so that the wind can blow across the tops of the necks. The vibrations of the sound spread through the ground and scare away the moles, who have very sensitive hearing.

Mouse control Cats are best for keeping mice down; otherwise mice can be deterred from eating pea and bean seed by soaking the seed in kerosene. If you suffer from them very badly, warfarin poison is safe for all animals except rodents.

Gopher control Gophers can be a real enemy to the gardener. Tiny windmills which make a clicking noise are said to deter them, although I have seen gopher damage quite close to such windmills. A more effective remedy is simply to put a gopher snake down the gopher's burrow.

Harvesting and Storing

Bird control For the most part, birds are useful since they eat insects, but they can do serious damage to vegetables, especially to a stand of corn, and of course small fruit, such as currants and raspberries, must be protected.

Birds can be prevented from attacking most crops with fine black thread stretched over the garden: the birds fly into the thread and frighten themselves. Nets are also effective. The traditional fruit cage (see p. 184) is effective but expensive. A good idea, I think, is to use a mini-greenhouse (see p. 111) with plastic or wire netting instead of the transparent plastic sheeting. Put this over the bed which is being attacked. It's easy to remove, or you can just prop it up while you're working. And of course you won't be duplicating equipment because you'll use the mini-greenhouse at other times of the year for its main purpose.

FUNGUS DISEASES

It's possible to garden all your life without resorting to a single fungicide spray and still get good crops. But there are times when even the best organic approach won't be enough to protect your potatoes, tomatoes or even your fruit trees.

Bordeaux mixture In blight years, potato blight can reduce your crop by as much as a half. To confine it, use Bordeaux mixture made by dissolving about half a pound (225 g) of copper sulfate in about six gallons (23 l) of water. Next, make a "cream" of five ounces (150 g) of quicklime mixed with a little water and pour the cream into the copper sulfate solution through a fine sieve. Test the mixture with a clean knife: if the blade comes out coated with a thin film of copper, add more cream to get the copper fully dissolved. If you make Bordeaux mixture yourself, use it within a day or two. Alternatively, you can buy it already made up at a garden shop.

Burgundy mixture For potatoes which are already suffering from potato blight, use a Burgundy mixture. This is made like Bordeaux mixture except you should use about two pounds (0.9 kg) of washing soda instead of the slaked lime.

HARVESTING

To get the fullest flavor from your vegetables and fruits, harvest them just before they reach maturity. As a rule, with most plants, the sugars which provide so much of the flavor begin to turn to starch at full maturity. New potatoes, for example, taste much sweeter than old ones – and sweet corn is so dull when it gets old that I

generally give it to the chickens. However, you can't put everything into the cooking pot just when it's right for eating, and vegetables and fruits for storing should be harvested when they are well and truly ripe.

STORING

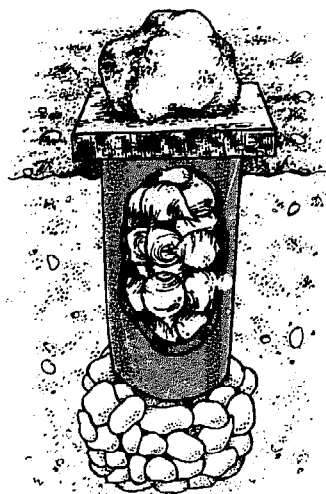
Seeds and pods It's essential that all seeds and pods are bone dry before they are stored, whether they are eventually to be eaten or used for seed. Hang them upside down by their stalks in a well-ventilated place under a roof. When seeds are dry thresh them out by hand – knocking the plants over the rim of a barrel is a good way – and hang them up in bags made of calico or other loose-woven fabric.

Stems and leaves In all but the coldest climates those vegetables of which you eat the stems and leaves, such as the *brassica*, celery, leeks, spinach and lettuces, can be left in the ground until required. In the coldest climates the *brassica*, celery and leeks can be stored in a cool cellar or basement.

Vegetable fruits The squash tribe are best hung in nets indoors at a temperature around 45°F (7°C). Green tomatoes should be stored at 60°F (16°C) in a drawer or some other dark place. Peppers can be dried indoors or out. Dry them on their vines and hang them up until you want them.

STORING ROOTS AND TUBERS

Bury a large diameter section of drainpipe, say 18 inches (45 cm) long, in well-drained soil. Leave a few inches exposed at the top and put small stones in the bottom for drainage. Fill it up with any root crop and cover it with a wooden lid. In frosty weather lay straw on the lid and weigh it down with a stone.



Roots and tubers For potatoes and other roots and tubers a root clamp (see p. 136) is best, but on a smaller scale you can store roots in a pipe buried in the ground. Carrots and beets can be stored indoors in containers filled with sand. Potatoes can be stored indoors at 45°F (7°C). Keep them in the dark, otherwise they will turn green. Other roots and tubers can be stored indoors at about 37°F (3°C); they must be well ventilated.

The Deep Bed Method

It would be unthinkable to publish a book on gardening for self-sufficiency at this time without fully describing the new method of gardening – or rather the very old method now revived – called variously the Chinese Method, the French Intensive Method, the Biodynamic/French Intensive Method or, by some of its practitioners, just the Method. The word “biodynamic” applied to gardening, is of course tautologous, because all growing things operate bio-dynamically: that is, they live and they move. I call this method, quite simply, the Deep Bed Method, because this describes it exactly.

In the nineteenth century the French “marai-chers”, or market gardeners, were working as near to Paris as they could get on small patches of expensive and scarce land. However, they had unlimited supplies of horse manure – for at that time Paris moved on horses – and they developed a system of gardening of a productiveness that has never been surpassed. It is not surprising that Chinese gardeners, also working near cities and therefore compelled to produce as much as they could off a limited amount of land, arrived at the same solutions as the French did.

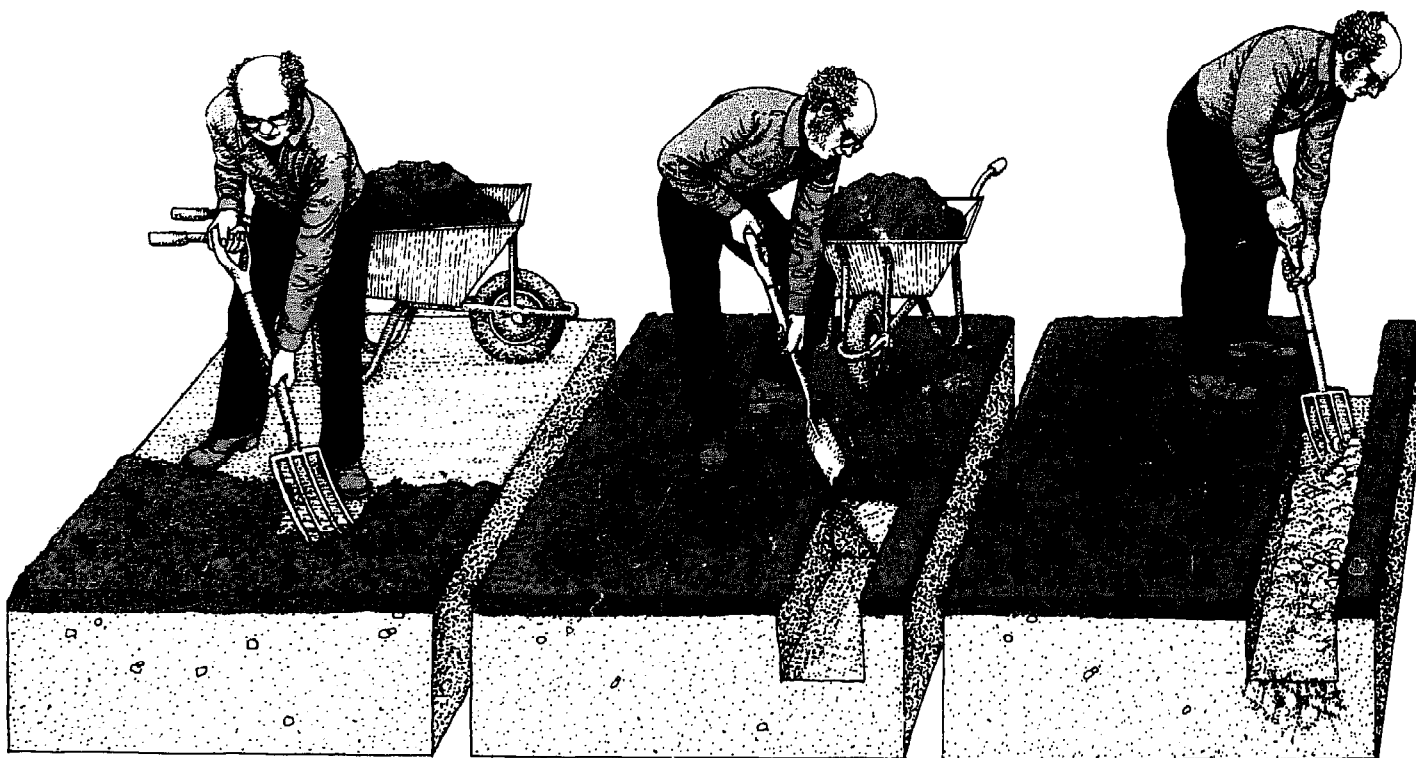
Alan Chadwick, an English actor who studied gardening first under Rudolph Steiner and then at

Kew, started experimenting with deep bed cultivation in South Africa. He moved to California in the 1960s and established a four acre (1.6 hectare) organic garden using this method at the University of California at Santa Cruz. Having established this he moved to the Round Valley in Northern California, where he now runs a seven acre (2.8 hectare) garden and has 60 students working with him. It was Chadwick who coined the name Biodynamic/French Intensive Method, using the word biodynamic after Rudolph Steiner.

Meanwhile several Chinese immigrants to the US had also been practicing the Deep Bed Method and one of them, Peter Chan, wrote a book about it: *Better Vegetables the Chinese Way*. Give or take a few inessentials the two methods are the same.

Digging a deep bed

The method is this. Drive four posts in at the four corners of your proposed bed and put a string right round them. The bed should be five feet (1.5m) wide and as long as convenient, but remember that to make it too long is to give yourself a long walk to get round it because you never tread on it. Twenty feet (6.1m) long is about right; this gives you a hundred square foot



SPREADING MANURE

Before you start to dig, lay a good covering of manure all over the top of the bed.

DIGGING THE FIRST TRENCH

Starting at one end of the bed, dig a trench a spade-length deep. Put the earth in a wheelbarrow.

LOOSENING THE SUBSOIL

Dig your fork deep into the trench and wobble it about to loosen the subsoil.

bed, which is convenient for making calculations about yields and so on. (The people who have been researching the method so far have been using the hundred square foot bed as a standard for calculations and comparisons.)

Lay a covering of manure on top of the proposed bed. The digging is basically bastard trenching, but you must be sure to loosen the subsoil. Take out a trench a spade wide and a spade deep at the top of the bed. Dig your spade or fork into the bottom of the trench and work it about so as to loosen the subsoil as deep as you can. Dig out a second trench next to the first one and throw the topsoil, and the manure that lies on it, into the first trench. Work the subsoil in the bottom of that too. Move on to the third trench and throw the topsoil into the second trench. Continue in this way until you reach the end of the bed. Then throw the soil you took out at the starting end of the bed into the empty trench that will be left at the completion end of the bed. The bed is then well and truly dug.

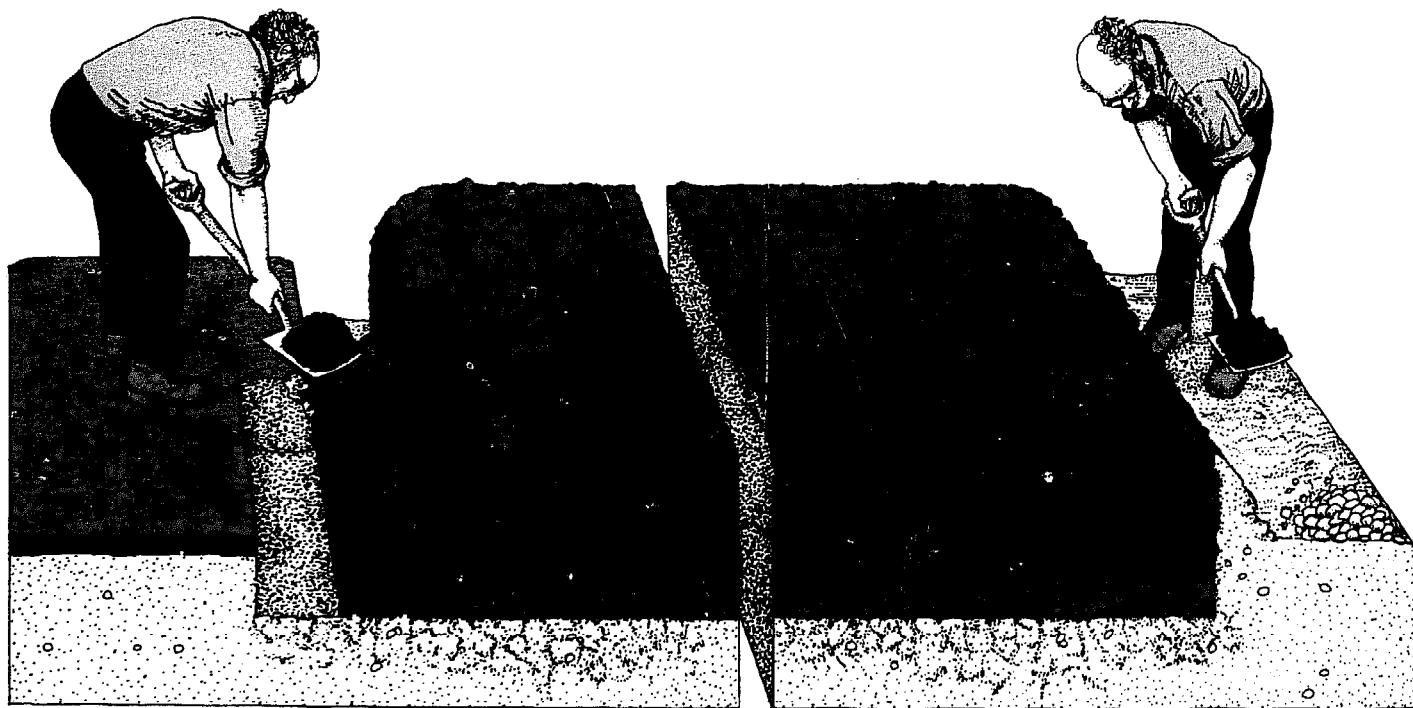
You can of course split the bed into two down the middle (see p. 81) and then you don't have to wheel the earth from end to end.

Thereafter — and I must repeat even to the point of tedium because it is the key to the whole

matter — never tread on the bed nor let anybody else tread on it until you come to fork it over the next year again.

John Jeavons, another California deep bed practitioner, has written a very good little book about the method (*How to Grow More Vegetables than you ever thought possible on less land than you can imagine*) and has carried out very careful controlled experiments for four years at Palo Alto. He estimates that it takes from six to ten hours to dig a hundred square foot bed for the first time. He believes in bastard trenching his deep beds every year, and finds that after the first year this does not take more than six hours, because the texture of the soil has been so improved since it has not been trodden on.

Peter Chan does not recommend digging again after you have done it once, and my own experience tends to make me agree with him: provided you put on plenty of manure or compost every year, and fork the land over once, the roots and earthworms will ensure that the subsoil does not get compacted again, and it is the compaction of the soil that inhibits plant growth. I find I can fork over a hundred square foot well-established deep bed, one spade deep, in ten minutes and it is light work.



BASTARD TRENCHING THE DEEP BED

Dig a second trench next to the first one, throwing the topsoil and manure into the first trench. Work the subsoil in the bottom of the second trench. Dig a third trench and repeat the process.

MAKING THE PATH

As you dig, throw all pebbles and stones to the side of the bed. When you finish, throw the topsoil from the path-to-be back on top of the bed. Spread the stones evenly over the surface of the path.

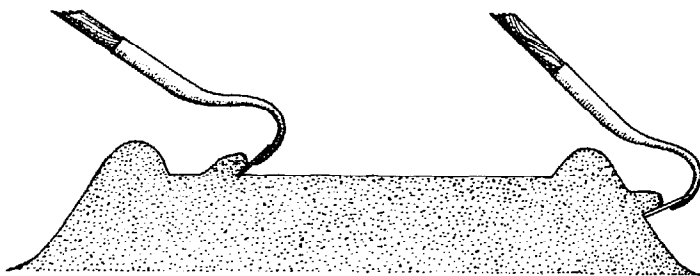
If you have several beds side by side, leave narrow paths between them. These paths are never dug, simply walked on. Some people leave their paths very narrow, but I find this makes it difficult to maneuver a wheelbarrow between the beds. So I make them 18 inches (45 cm) wide. You may feel you lose land by having all these paths, but the much closer spacing of the deep bed makes up for this loss of land and in fact you lose a strip of land almost as wide as this between every row in conventional gardening. Also, as the years go by your deep beds will get more and more convex until they stand perhaps 18 inches (45 cm) above the paths.

As you dig your deep beds throw any stones you find in a pile on one side. Then, when you make the paths, throw the topsoil from the path on the bed and scatter the stones in their place.

Some deep bed gardeners build small walls of brick, stone, or timber around their beds to hold the sides up. In my view such arrangements only harbor slugs and are not necessary, because the beds do not, in practice, erode. Ordinary good organic practice dictates that the earth should be covered for most of the time by a crop, even if it is just a green manure crop, and this will hold it together. In any case well manured soil will not erode even if it is left bare in high beds.

DEEP BEDS IN DRY AREAS

In very dry areas it is worth shaping the beds with a draw hoe, so that they rise steeply at the sides and form a basin shape at the top. The moisture is then conserved when the beds are watered. In wetter regions the looseness of the soil in the deep bed is enough to ensure that rain or spray percolate into the earth at once.



Sowing and planting in a deep bed

Now, in your newly dug bed, either plant out plants from a seed-bed or seed boxes, or simply sow the seed direct into the ground, just as you would with a normal bed. The difference is that you sow or plant four times as densely, or thereabouts, as you do when gardening in the traditional way. The reasons for this are explained in detail further on, but are to do with the fact that you never walk on the earth between the rows so that the soil remains loose and uncompacted.

You do not sow or plant in rows with wide spaces in between. Instead you work to a triangular pattern so that your crops grow in clumps. The overall effect is of very closely spaced diagonal rows. And in almost all cases you should allow much less space between the plants in all directions than you would between plants in traditional rows. The basic objective is to space the plants so that their leaves are just touching when they are mature.

You do not need the normal spaces between rows, because you never walk between the rows. The soil is loose and untrodden, so the roots of the plants can go down straight and deep – when you pull a plant grown in this way, you will be amazed by the size and length of its roots – and therefore the plants do not need nearly so much space at the surface.

The fact that the plants' leaves just touch when they are mature means that they create a microclimate in dry weather which conserves moisture. You should find that you use from a quarter to a half of the water you use in conventional gardening. Weeds are of course suppressed by this close planting; you can hoe gently from the sides of the bed before the plants meet each other or, even better, just hand-weed. Out of this soft deep soil weeds come out so easily, roots and all, that there is no trouble getting rid of them. Weeds are really no problem with deep bed gardening.

An obvious question is – what about crops like *brassica* and onions which gardeners have always believed need firm soil? What about all those exhortations to stamp and dance about on beds before planting them? Well, in husbandry only one argument is of the slightest weight and that is experience: what actually happens. I have grown crops of *brassica* by this method; the vegetables have been magnificent and the yields have been extremely impressive.

All that you do when you plant out *brassica* or onions is plant considerably deeper than you would normally and then press the ground fairly firmly down around the plant with your hands. Only the top few inches of the soil are thus compressed but in practice it seems to be enough. This does not, in this very loose soil, make onions "bull-neck" – in any case you can gently remove the earth from around the onions later on.

The deep bed practitioners favor frequent transplanting of plants before they are put out in the beds, but they always plant into, if possible, better and looser soil than the plants were in before. Thus, if you prick plants out from a seed

CHICKEN WIRE FRAME

A frame with a one inch (2.5cm) mesh of chicken wire will help you space seeds and seedlings accurately. Plant through the centers of evenly spaced hexagons.



CREATING A MINI-CLIMATE

If the seeds have been correctly spaced, the leaves of the plants should just touch each other when they are mature. This creates a mini-climate which conserves moisture in dry weather.

SPACING OUT SEEDS

Sow seeds in the deep bed in a triangular spacing pattern, with each seed the same distance from those surrounding it.

USING A BOARD

If you dislike stretching to the center of the bed, squat on a piece of board five feet by three feet (1.5 x 0.9 m). Your weight, evenly distributed, will not compact the soil.



box into another seed box to give them more space, make sure that the compost in the second box is at least as good, preferably better, than that in the first box.

The spacings for sowing and planting different crops are given in the chapters on the Cultivation of Vegetables and Fruit (pp.113—190). These should be used as a guide only; every person should experiment for himself and use his common sense. After all — how big is an onion — how big is a carrot? Everybody knows, and provided the tops of the plants are given sufficient room their roots will be all right because there is plenty of room below a deep bed.

With conventional gardening the roots cannot penetrate the compacted earth below, and must spread out laterally where they compete mercilessly with each other, and get cut and damaged every time you tread near them. With deep bed gardening the roots go way down into the loose soil, with nothing to stop them, and there is nothing to damage them when they are there.

Deep bed yields

Careful records have been kept, at Santa Cruz and other places, and the deep beds have been found to yield, quite consistently, four times the crop produced by conventional gardening.

I, like many other vegetable gardeners had read these figures but did not fully believe them. So I went to California to see for myself, and spent some time there searching out every example of deep bed gardening that I could find. Seeing is believing and in this case I am completely convinced of the superiority of this method. Four times the crop is about right and I never saw a case of this gardening being practiced correctly that did not, more or less, bear out this figure. On the strength of this I returned home and tried it for myself, and I have now proved, through personal experience that it certainly does work.

Deep beds for perennial vegetables and herbs

Obviously you cannot dig perennial beds every year, but it is well worth creating a deep bed by digging the land very deeply once – perhaps three spade lengths deep – but leaving the subsoil underneath. After that never tread on the bed.

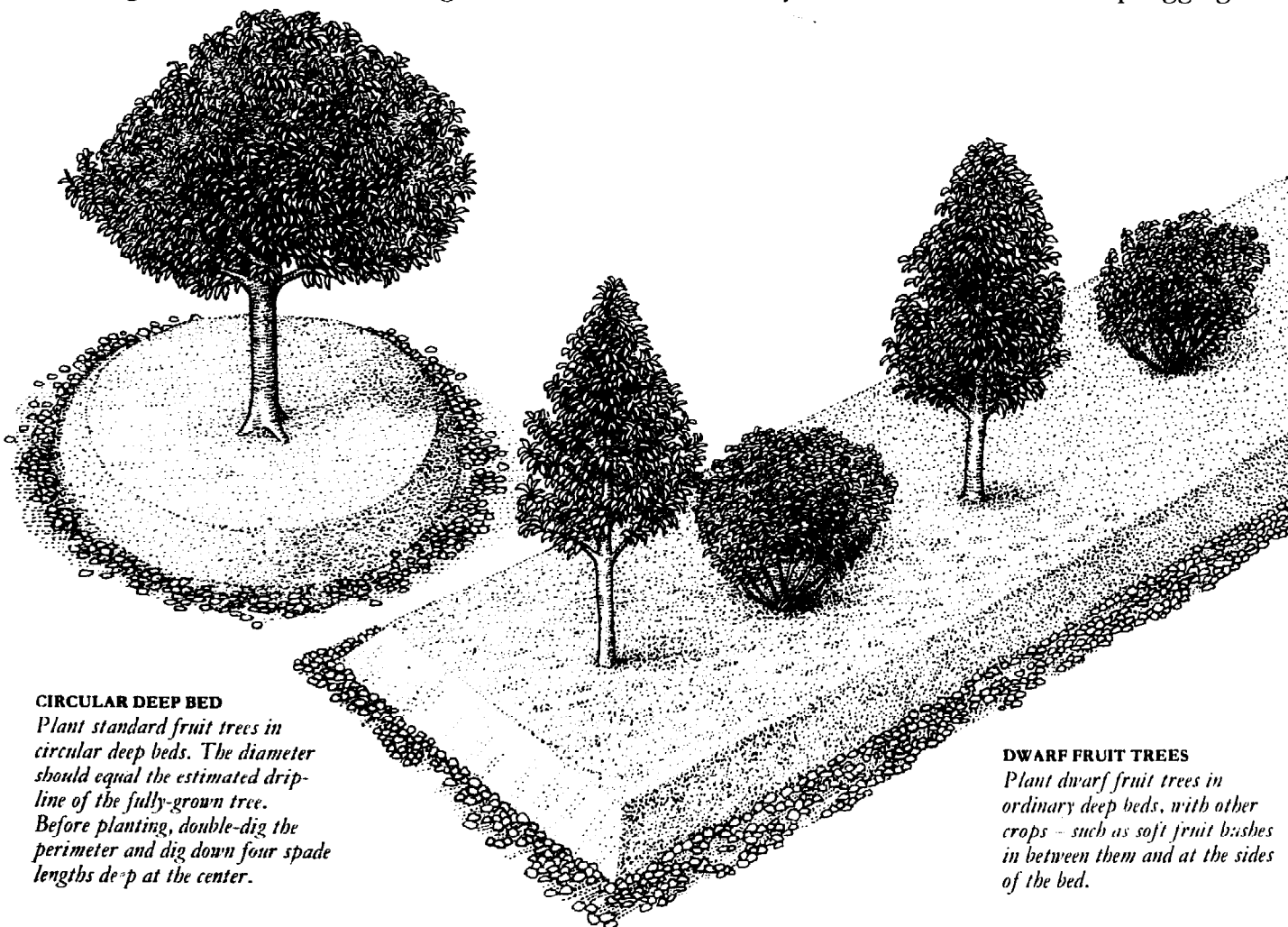
Deep beds for fruit

All soft fruit bushes, and also top fruit trees on dwarfing root stocks trained as goblets or dwarf

pyramids, can be grown successfully in deep beds. Alan Chadwick is experimenting with dwarfed top fruit trees with other crops growing under and around them. This is a new technique (the French deep bed gardeners never bothered to grow top fruit on their deep beds), but it seems successful.

If you like big fruit trees, you can plant them in circular deep beds – one tree to a bed. Simply mark out a circle round the likely drip-line – the area to be over-hung by the tree. Double-dig this circle around the edges and dig very deeply – four spade lengths would be ideal – at the spot where you are actually going to plant the tree. Plant the tree in the normal way (see p. 98).

It is known that the roots of trees advance much more quickly in unconsolidated soil. It is also easy to observe that roots tend to come upward toward the surface. If you can keep the earth within range of a tree's roots soft and open, you can give the roots the conditions they need for rapid growth without constantly digging into them with a spade or cultivator. The only way you can achieve this is by not treading on the soil ever, at all, after you have done the initial deep digging.



CIRCULAR DEEP BED

Plant standard fruit trees in circular deep beds. The diameter should equal the estimated drip-line of the fully-grown tree. Before planting, double-dig the perimeter and dig down four spade lengths deep at the center.

DWARF FRUIT TREES

Plant dwarf fruit trees in ordinary deep beds, with other crops – such as soft fruit bushes in between them and at the sides of the bed.

Mini-greenhouses

The idea of the mini-greenhouse, which has been growing in popularity, is to bring lightness, mobility, flexibility, and economy into the business of protecting plants from the weather. The trend in the last twenty years has been toward cheap plastic structures, principally plastic-covered tunnels. These work, but are troublesome. You cannot hoe under them without removing them and this is always awkward and time-consuming.

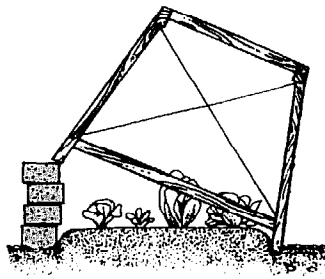
The mini-greenhouse, on the other hand, is very light and can be moved easily by two people from one bed to another. A proper rotation of crops that are usually grown indoors can be practiced without the laborious soil changes, or expensive soil sterilizations, that have to be carried out in fixed greenhouses. In other words you never have to grow either tomatoes or cucumbers two years running on the same bed.

Building a mini-greenhouse

A convenient size for a mini-greenhouse is 20 feet by five feet (6 x 1.5 m), because this will fit over a standard-sized deep bed, and besides it is fairly

MINI-GREENHOUSE COMPONENTS

Use two inch by one inch wood for the basic structure. Make proper joints, join the pieces with long nails hammered right through both pieces of wood and clenched. Strengthen the structure with wires. Use nails and wooden battens to fix a large sheet of transparent plastic right over the top and sides. Fit smaller pieces of plastic to the ends. Make pin-holes in the top to let the rain in.



OPENING MINI-GREENHOUSES

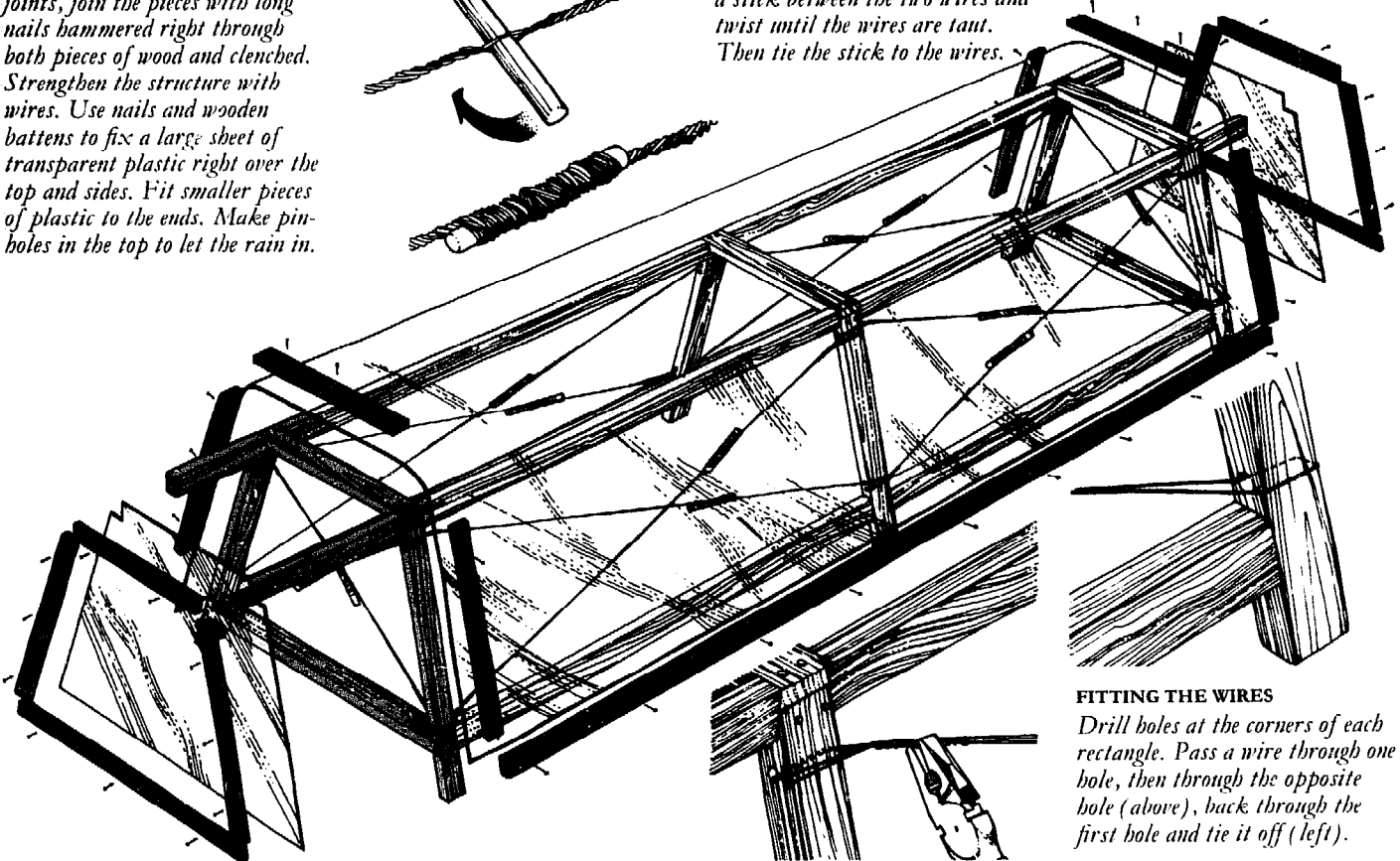
When you want to work on a deep bed under a mini-greenhouse — for hoeing, thinning, harvesting and so on — all you need to do is to prop up one side of the mini-greenhouse on a pile of bricks or on a piece of wood.

easy to handle. Use two inch by one inch (5 x 2.5 cm) wood, and for permanence make proper mortise and tenon joints. Brace the structure with ordinary thin wire; this hardly adds to the weight and does not cost much, but it increases rigidity enormously.

The wires should be pulled quite tight. Tie one end of a wire to a top corner of the mini-greenhouse, drill a hole in the strut at the opposite corner and thread the free end of the wire through the hole. Haul the end of the wire as tight as you can with a pair of pliers. I always grip the wire tight with the pliers just where it emerges from the hole and twist the pliers round the strut so that they act as a lever to pull the wire even

STRAINING THE WIRES

When you have fitted a double length of wire (below right), push a stick between the two wires and twist until the wires are taut. Then tie the stick to the wires.



FITTING THE WIRES

Drill holes at the corners of each rectangle. Pass a wire through one hole, then through the opposite hole (above), back through the first hole and tie it off (left).

tighter. You can then just wind the end of the wire round its own standing part.

Alternatively, you can use a much longer wire, double it back and poke its end through a hole near the top corner where the wire came from; strain it there and tie it off. In this way you have strained wires side by side and you can strain them further by pushing a stick through them and winding it round and round. When the two stretches of wire have been twisted round each other, fix one end of the stick to the wires with another short piece of wire so that the bracing wire does not unravel. Beware any loose ends of wire that will puncture your plastic sheeting. Use a single large sheet of plastic to cover the top and sides of the structure, and small piece at either end. Attach all the edges of the plastic to the structure with wooden battens. Don't leave any ends unattached: if you do, the plastic will rip in the wind. Make a row of tiny holes in the top sheet of the plastic to allow rain water to sprinkle down on to the plants below, instead of forming a lake.

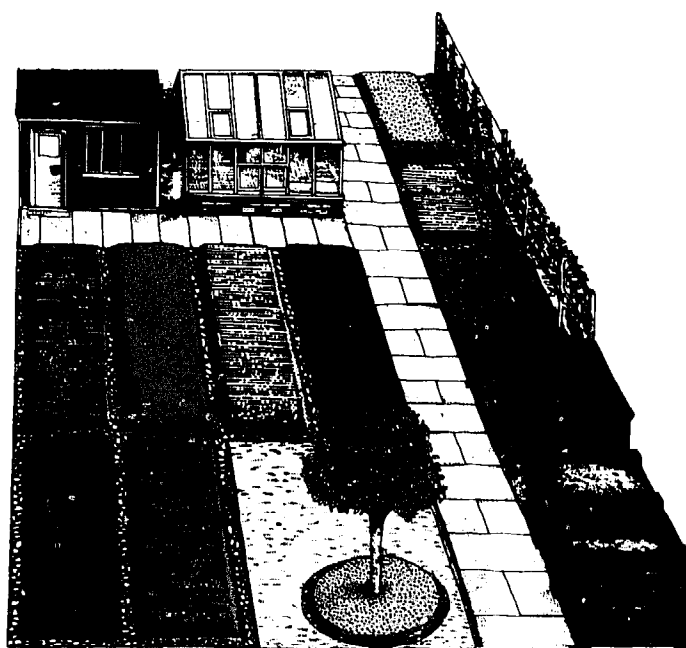
Using a mini-greenhouse

Use the mini-greenhouse as much as possible. Use it in winter to cover winter lettuce. Move it on to newly planted cauliflowers after that. When they have got a hold move it to protect early potatoes and then on to bush beans perhaps. In the warmer weather use it on tender vegetables like eggplants, melons and peppers. And you can cover your mini-greenhouses with bird netting instead of plastic to protect your seed-beds.

PLANNING A DEEP BED GARDEN

If I were to take over a new garden I would have no hesitation about turning it into a deep bed garden as soon as possible. I am, in fact, turning my existing garden into a deep bed garden at the moment. There is some capital labor – work that only has to be done once – involved in doing this, and maybe this should be done little by little, one bed at a time when the time and energy are there. However, the aim should be a whole garden of deep beds. Once your garden is completely given over to deep beds, you will need to do much less work on it than you used to do in your conventional garden, but the results should be considerably more impressive.

Except that you will be more or less tied to beds five feet (1.5m) wide or less, and that it is a good idea not to have beds so long that it becomes a bore to walk round them, there is no difference between the general planning of a deep bed



CONVERTING YOUR GARDEN TO DEEP BEDS

This is the garden shown on page 70, replanned so that the same crops can be grown in deep beds. There is room for six deep beds, each 20 x 5 feet (6 x 1.5 m): four for the vegetable rotation, one for perennial vegetables and one for soft fruit. The old perennial bed in front of the espaliers which now stand in a deep bed, now contains alternate dwarf fruit trees and soft fruit bushes. The herbs are now also in a deep bed, and a standard fruit tree has been planted in a circular deep bed. The seed and holding-beds remain the same.

garden and that of an orthodox one. The rotations will be just the same. The general layout will be similar, although in larger gardens each division of the rotation may take up two or more separate deep beds, because of the width limitation.

Your perennials and herbs will be planted in deep beds not more than five feet (1.5m) wide. If your herb bed – or any other bed – is up against a wall it will need to be about three feet (90cm) wide, because you will only be able to reach into it from one side. Your soft fruit bushes can share a deep bed with some dwarf fruit trees, and you can plant standard fruit trees in circular beds.

You will very likely find yourself doing far more in the way of interplanting. You might even try the sort of mixed tree fruit, soft fruit, vegetable and flower beds that Alan Chadwick is trying in California. In your deep beds you are exploiting another direction in gardening: downward. You are making it possible for the roots to go deep, and saving them the necessity of spreading out laterally and thereby competing with one another for space. You can cram plants closer together.

Remember that this form of husbandry is in its infancy in the West (no matter how long it may have been practiced in China and Japan) and there is plenty of scope for learning and experimenting.

CHAPTER FIVE

The Cultivation of Vegetables



*Containing the sowing, growing and harvesting
instructions for members of the families Leguminosae,
Cruciferae, Solanaceae, Umbelliferae, Liliaceae,
Chenopodiaceae, Cucurbitaceae, Compositae,
Gramineae, Malvaceae and Polygonaceae.*

Leguminosae

Peas, broad beans, pole beans, bush beans, lima beans, soybeans and peanuts are all members of the *Leguminosae*. For those who wish to grow as much of their own food as they can in a garden, this family is surely the most useful of the lot. In the first place – it provides more protein than any other. It is hard to see how a vegetarian, or for that matter any person who aims to be completely self-sufficient without much meat, can subsist in a healthy state, without the *Leguminosae*.

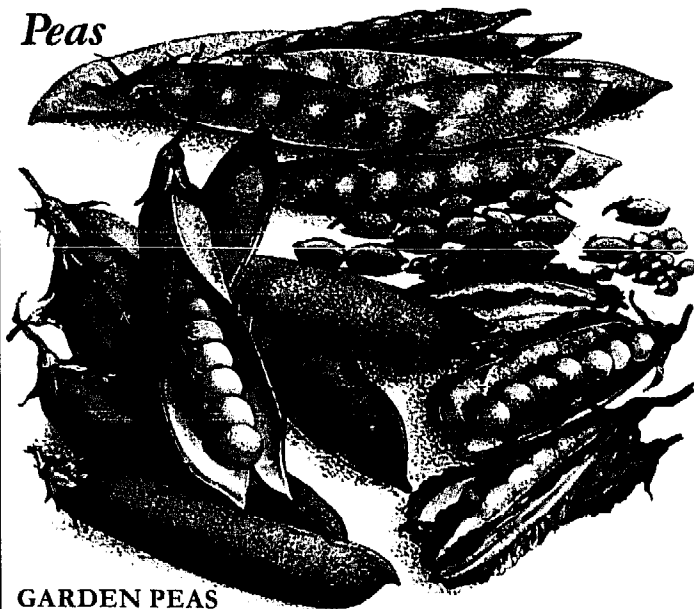
The other useful thing about the *Leguminosae* is their nitrogen-fixing ability. Organic gardeners who don't like spending their money on expensive nitrogenous fertilisers (which make the soil lazy about fixing its own nitrogen) find that peas, beans and the clovers are the answer. For the *Leguminosae* are the plants which are able to fix nitrogen in the nodules on their roots. Pull out any healthy leguminous plant and examine its roots. You should find small pimples or nodules. If you were to cut these open and examine them with a powerful microscope you would see bacteria. These live symbiotically with the plant. The plant feeds them with everything they need except nitrogen: they fix nitrogen from the air (combin-

ing it with oxygen to form nitrates), and this they use themselves and also feed to the host plant.

If you grow any leguminous plant, and dig it into the soil when it is lush and green (at the flowering stage) it will rot down very quickly, providing its own nitrogen to feed the putrefactive bacteria, and this nitrogen will then be released into the soil. It is worth growing clover for this very purpose. If you put leguminous plants on the compost heap they will have the same beneficial effect. If you have a lawn, remember that if you put nitrates on it, you will encourage the grasses but suppress the clover. If you put on phosphate you will encourage the clovers at the expense of the grasses.

Leguminous plants should account for at least a quarter of your garden each year and there is nothing wrong with having far more than that. They are not acid-loving plants, so if your soil is acid give it lime. They also like phosphate and potash. But in good garden soil that has been well manured or composted over the years, and in which any serious lack of lime, phosphate or potash has been corrected, you can grow peas and beans without putting anything on at all.

Peas



GARDEN PEAS

The first fresh peas of the summer eaten raw are one of the great rewards of growing your own vegetables. And later in the season, of course you can cook them and dry them. Whatever you do they are a great source of nourishment. Dwarf peas are a good idea for a small garden.

Soil and climate

Peas are not too fussy as regards soil; light soil will give you an early crop, heavy a late one. A rich loam is best, and any soil can be turned into this by constant composting. As for climate, peas are not a tropical crop and will grow well

in cool climates, with plenty of moisture, but too much rain when they are ripening will give them mildew. In hot latitudes they generally have to be grown in the spring or fall, to avoid the very hot part of the summer. As small plants they are frost-hardy, therefore in climates where frosts are not too intense they can be sown in the fall for a quick start in the spring. They will not grow fast and produce flowers and pods, however, until the arrival of spring and warmer weather.

Soil treatment

Peas need deeply cultivated ground. If you are trying to grow them in land that has previously been gardened inorganically you should try to spread 700 to 1000 lbs (350 to 500 kg) of manure or compost on every 100 square yards (84 sq m). Put this on the land the previous fall, and possibly

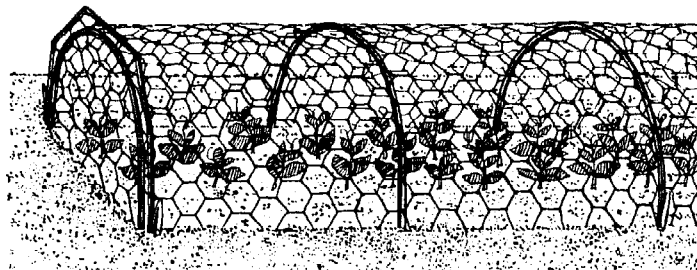


DRILLS FOR PEA SEED

Use the flat of a draw hoe to make broad drills about two inches (5 cm) deep and four inches (10 cm) wide.

SOWING PEA SEED

Sow evenly, leaving an inch or two between seeds. If necessary you can keep mice away by dipping the seed in kerosene before planting.



PROTECTING PEAS FROM BIRDS

Nothing pea-guards, which you can easily make yourself, will protect seeds and seedlings from attack by birds. So will mini-greenhouses (see p. 111) such as you use for deep beds; but you should cover them with wire rather than with plastic.

25 lbs (11 kg) of slag or ground rock phosphate per 100 square yards (84 sqm) and 10 or 12 lbs (4.5 to 5.4 kg) of wood ash. Peas don't like acid soil; if the pH is about 6.5 that is all right. If it is below this, lime it; a quarter of a pound (100 g) per square yard is about right.

If your soil is not yet sufficiently fertile and you cannot bring in enough compost or manure from outside, you can still grow excellent peas over trenches taken out the previous year and filled during the winter with kitchen garbage and other material which will readily decompose, such as old newspaper. The organic gardener's aim, though, should be to raise the whole of his garden to a high level of fertility, so that such piecemeal treatments as this are unnecessary.

Propagation

I make broad drills with the flat of the hoe, about two inches (5 cm) deep, and four inches (10 cm) wide. I then sprinkle the seed in evenly, so there is an inch or two between each side. I then rake the earth back into the trench from each seed and bang down firmly with the back of the

rake or, if the land is puffy and dry, I tread it with my feet. A good soaking of the drill, if the soil is dry, will then start them growing. If you use the deep bed method (see p. 106), allow three inches (8 cm) between plants all ways. You leave this distance in the deep bed because you are not sowing in rows, of course, but in clumps.

Many people speed up germination by soaking the seed, for as long as forty-eight hours, before they plant it. It should be remembered that all these seeds that are large and edible, like peas and beans, are an open invitation to rodents and birds, and so the sooner they start to grow the less time there is for them to be eaten by something. Birds may have to be kept away by thin black threads, or, better still, inverted wire-netting pea-guards. And if you are troubled by mice, dip the seed into kerosene just before planting. The mice don't like the smell.

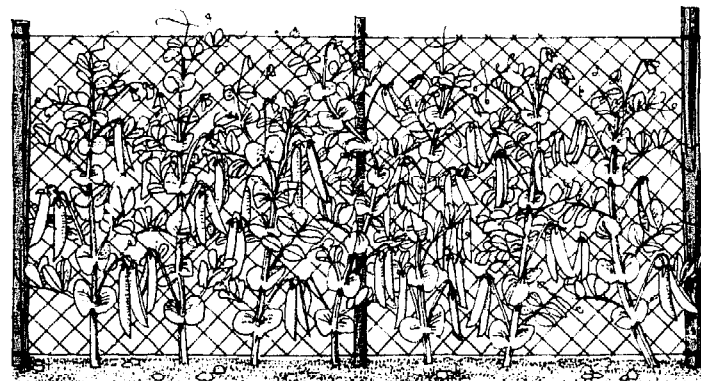
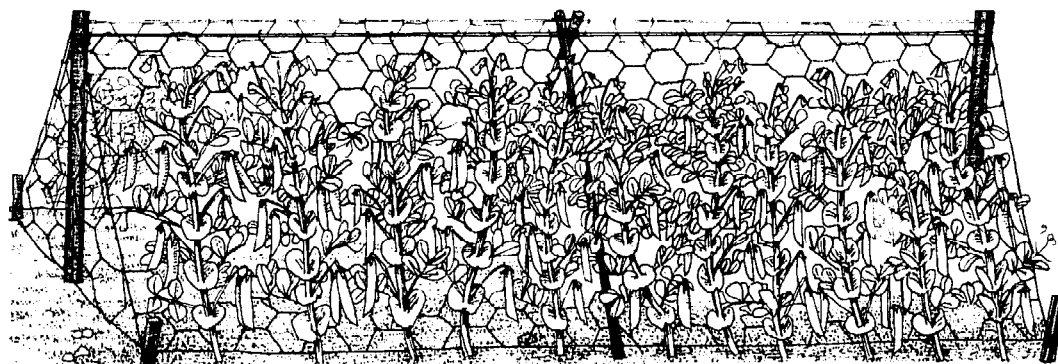
Now peas take about three months to grow to maturity: perhaps two and a half if you plant early varieties or if you like your peas very young like I do. Sow them successively, every two weeks from late winter to mid spring and you will get fresh peas most of the summer.

Care while growing

All but the smallest dwarf peas are better if they have sticks to grow up. Any fine branches with some twigs left on them will do for this. Hazel trimmings make ideal pea sticks. If you need a hedge between your garden and the next one use hazel. It will give you nuts as well as pea sticks. If you just can't get pea sticks then use wire netting. Get the coarsest mesh you can (it is cheaper), say three feet (90 cm) wide, and make an inverted "V" of it so that a row of peas climbs up each side. This method has the advantage that many of the peas hang down inside the wire where the birds can't get at them. If the wire is wide gauge, you will be able to get your hand in to pick the peas; otherwise you can put your hand down through the gap in the top. There are plenty of dwarf

BUILDING WIRE PEA FRAMES

You can build a "fence" of wire netting for peas to climb up, or you can build an inverted "V" shape and train a row of peas up each side. The peas will dangle into the middle where the birds can't get them. Use wide gauge netting because it is cheaper and you can get your hands through the mesh quite easily.



TRAINING WITH PEA STICKS

Any branch with a few twigs left on it will make a pea stick. Hazel branches are especially good, as they will provide you with nuts as well as sticks. Cut them to a length of about four feet (1.2 m), sharpen the thick end and drive well into the ground beside each plant.



pea varieties available, and these generally need no support at all. They are worth growing in a small garden, but the yield is low and unless you take precautions (see p. 104) slugs are likely to attack the peas near the ground.

Peas don't like drought, and watering in dry weather always pays in more peas, but remember that soil rich in humus retains water more efficiently.

Pests and diseases

Pea and bean weevil This creature is the color of soil, falls off the plant and plays dead when you disturb it, and is nocturnal; it hides under clods of earth during the day. No-digging gardeners suffer from it badly because the compost with which they have to cover their ground gives it splendid cover. It nibbles round the edges of young pea leaves and often eats out the growing centers. Dusting the plants with lime, while the dew is on them, is usually an effective deterrent. Alternatively you can spray the young plants and the surrounding ground with quassia spray, or nicotine mixture (see p. 104).

Pea moth This is a small brown moth that lays eggs on young pea pods. The larvae bore in and eat the peas. If you dig, or cultivate, the soil frequently, but very shallowly, during the winter you can get rid of these pests, for the birds (chiefly robins and starlings) will come along and eat the pupae - thereby breaking the moth's life cycle.

Pea thrips These are tiny brown-black insects which make minute holes in the leaves of pea plants. The plants become yellow and shrivel up. A thorough drenching with soapy water will get rid of them.

Mildew In very damp weather pea leaves and pods may go white with mildew, and then rot. Using tall pea sticks, so the peas can climb high, helps prevent this. Don't water the

foliage of peas in hot muggy weather. Spraying with Bordeaux mixture sometimes works. Otherwise there's not much you can do about it, but it is not disastrous.

Harvesting

Always use both hands to pick peas! Put the basket on the ground, and hold the vine with one hand and the pod with the other.

Very young peas taste quite exquisite raw and contain high doses of vitamins A, B and C. They are very sweet because they contain sugar. A few hours after the peas are picked this sugar turns to starch, which is why bought peas taste dull and dried peas completely different. If you pick peas and freeze them immediately you can preserve this sugar, which is why frozen peas don't taste too bad.

I like to eat fresh peas all summer and then enjoy dried peas, rather than frozen peas, during the winter, so that I come to the first fresh peas in early summer with a fresh palate and enjoy what is then an exquisite gastronomic experience. The palate jaded by "fresh" peas all the year round never has this great sensation.

As fresh peas grow older and tougher on the vine you have to boil them. When your peas get too tough to be good boiled, leave them on the vines and just let them go on getting tougher. Wait until they are completely ripe, as hard as bullets; then pull the vines out and hang them up in the wind but out of the rain. When they are thoroughly dry thresh the peas out of them; either rub the vines hard between your hands, or pound them over the back of a chair. Put the peas away, quite dry, in covered containers. When you want some in the winter soak them in water for a day or two. Then boil them with salt until they are soft, and eat with boiled bacon. A plate full of that, in December, and you are fit to go out and dig for a few hours.

Pea pods make the basis of a good soup. Boil them well and pass them through a sieve.

SUGAR PEAS

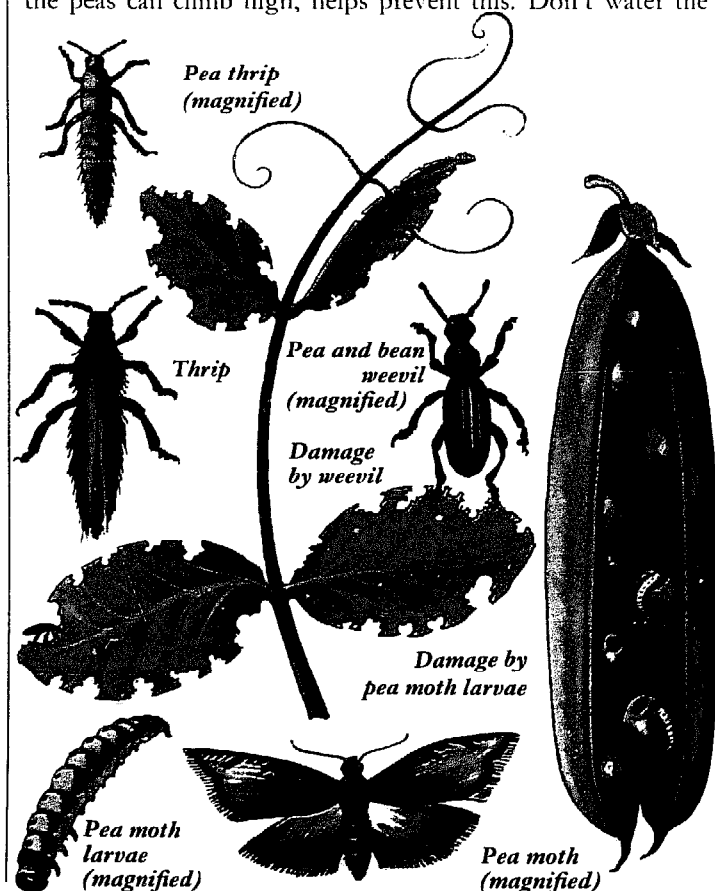
These are also called edible podded peas. Cultivate them like ordinary peas. The difference is that you harvest and eat the pods with the young peas inside them, because they lack the hard membrane that lines the ordinary pea pod. Start picking and eating the pods as soon as they are about two inches (5 cm) long and when the peas inside are tiny flat bumps. You then have a long picking season because you can go on picking until the peas inside are quite big. These are widely used in Oriental dishes and are noted for their sweet flavor and crisp texture.

ASPARAGUS PEAS

These are not true peas, but you can treat them the same way, although you must plant them later, say in mid-spring, and if you live in a cold place, protect them with cloches. Support them just like peas. Cook the complete pods when they are about an inch long. They are quite delicious.

LENTILS

Lentils are closely related to peas and are excellent for drying. However, they are low yielding and are really only worth growing if you have space to spare after allowing for your staples. They like the same climatic conditions as peas, and do best on a sandy loam. Propagate them and care for them exactly as though they were garden peas. When the plants are well ripened, pull them out and hang them up in a shed. Thresh when required.



Broad Beans



For the self-supporting gardener broad beans are one of the most important crops. They really will feed you and your family right through the year, and if you have dried broad beans and potatoes you will not starve. The old English broad bean was the "longpod", and this is still the bean to grow if you really want food which will keep you in high protein vegetable nourishment right through the winter as well as the summer - (unless your climate and conditions enable you to get a good yield with soybeans). All the other beans, like pole beans, bush beans and dwarf beans are native to the American continent, especially the hot parts of South America. They are all very frost tender. The longpod broad bean however, can stand up to a fierce winter and get away early in the spring. It stands up straight and tall, needs no support, and produces a heavy crop of fine big kidney-shaped seeds, which can be either cooked and eaten fresh, or dried and kept for the winter.

Tic beans, horse beans and cattle beans, which are all grown by farmers to provide high protein grain for feeding animals in the winter, are varieties of the same plant. Their seeds are smaller and white, but they are heavy cropping. They are more liable to get chocolate spot disease than broad beans and they are said not to be edible before Christmas. But then they are said not to be fit for human consumption yet I eat them freely every winter.

The ordinary longpod broad bean, however, is the best thing for the gardener; but if you can get a handful of tic beans from a farmer, why not experiment with them and see what happens?

Soil and climate

Broad beans like strong soil, even heavy clay, but compost rich soil suits them no matter what the original soil was - clay or sand. Their behavior in different climates is very similar to that of peas (see Peas). If you can plant out your peas in the autumn, then you can do the same with your broad beans, for they are rather more hardy than peas.

Soil treatment

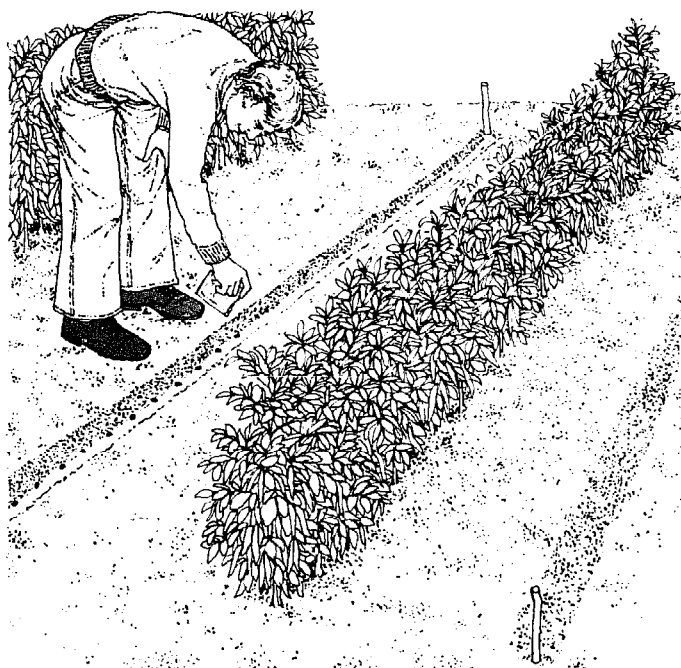
Beans don't like too much acid; like peas they find a pH of 6.5 ideal. Potash does them a lot of good, so if you have a limited supply of wood ashes put it on your broad bean patch at a rate of about four oz (100g) to two yards of row. Comfrey too, dug in as a green manure, is good, both for the potash that it contains and for its capacity to hold water.

Dig the soil deep and well, digging in ashes and comfrey leaves if you have them, and as much manure or compost as you can spare. I like to plant broad beans after main crop potatoes, so the soil is already full of manure which was put in for the spuds, and it has been well worked. Lime, then, is only necessary if the pH is much below 6.5.

Propagation

It is far and away better, if you live south of the heavy snow line to sow your broad beans in the fall, in say October or November. If the birds get them, or it is too cold where you are, sow them as early as you can in the spring - as soon as the soil can be worked with ease. It is best to soak the seeds in cold water for twenty-four hours before planting them; this softens them up and gives them a head start over the birds.

Take out drills about three inches (8cm) deep with the hoe, drills about two feet (60cm) apart, and put the seeds in six inches (15cm) apart. Or - and here I think is a very good tip - sow them in rows six feet (1.8m) apart and, later, sow bush or dwarf beans in between the rows. Broad beans make a fine nurse-crop for these more tender plants, keeping the wind off them. Instead of digging drills you can put out a garden line and make a hole with a trowel for each seed. If you use the deep bed method (see p.106) leave four inches (10 cm) between plants in all directions.



INTERCROPPING WITH BROAD BEANS

Tough, tall broad beans make an excellent nurse-crop for smaller plants like bush beans. Plant the broad beans in rows six feet (1.8 m) apart in fall or early spring. When the weather warms up in early summer fill the spaces between the rows with low growing bush beans.

Care while growing

As the young beans grow it is a good idea to hill them up a little with the hoe. Keep them clear of weeds of course. In windy and exposed positions, it is worth driving in a stake at the corners of the rows, and running a string from stake to stake right around each row, to prevent the beans being blown over. In most gardens though this is not necessary. Any sort of mulching between the plants is valuable.

Pests and diseases

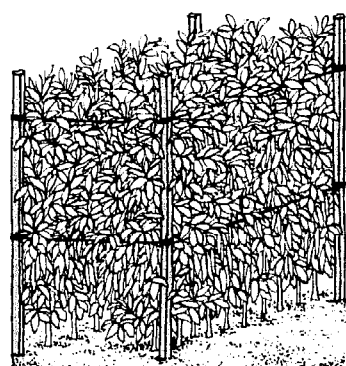
Chocolate spot This looks exactly like its name, and if you get it there is nothing you can do. If you get it early, it will lower your yield considerably, but a late attack is not so bad. To guard against it you need plenty of potash in your soil. If you keep getting it in autumn-sown beans, you must give up autumn sowing and sow your beans in the spring instead, because these are less liable to attack.

Bean rust You are not likely to get this. The symptoms are small white spots on leaves and stems in the spring. Spray with diluted Bordeaux mixture (see p. 105), and burn all your bean straw after harvesting to destroy the spores.

Black fly or aphid If you sow spring beans you are very likely to get this, and in fact unlikely not to get it. It does not trouble autumn-sown beans very often. The aphids can only pierce the skin of tender young growing points and the winter beans are generally grown enough by the time the aphids are around. If aphids do attack you will find them clustered on the tips. If the beans have already grown high enough pick these tips off; this will deny the fly its food. You can cook and eat the tips; they are tender and juicy. If you get a really bad attack spray the plants hard with soft soap and kerosene solution. Bees love bean flowers, so it is important not to spray with anything that will harm bees. Pyrethrum sprayed at night will kill the aphids and not harm the bees in the morning.

Pea and bean weevil (See Peas).

Bean mildew Spray with Bordeaux mixture.



SUPPORTING BROAD BEANS

If your broad bean patch is exposed to wind, support the plants with strings run between stakes, which are driven in at the ends of the rows.



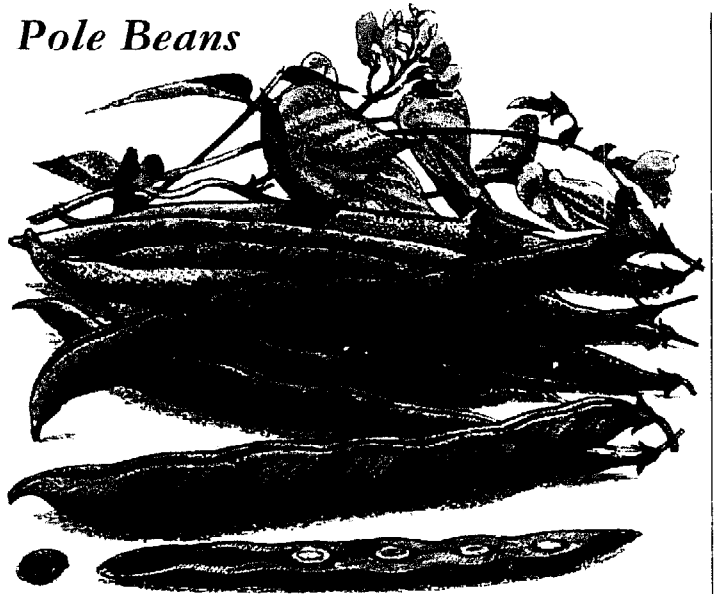
BANISHING BLACK FLY

If you get black fly or aphids on your broad beans they will almost certainly cluster on the tips. If the beans have grown high enough, simply pick the tips off.

Harvesting and storing

The tips of growing broad beans, nipped off in the spring to thwart black fly, are one of the first and most tasty fresh greens of the spring. Soon after eating these, you can start pulling the very small pods and cook them as they are. Later the pods get too tough for this so you split them open, remove the beans from their silky beds and cook the seeds. When the seeds get too tough for this let them dry on the plant, and harvest by pulling out the whole plant. Then hang it in an airy but dry place. Shuck the seeds out when they are quite dry and store them for the winter. Soak them for at least twenty-four hours (twice that long is not too much) before cooking and then boil them well. Eaten either with butter, or with bacon, they will give you strength to face the winter.

Pole Beans



Pole beans, as the name implies, are climbers. They take up little space and can be trained easily up walls, fences or wires. They are both attractive and nutritious, and are therefore ideal for the small-scale vegetable garden.

Soil and climate

The pole bean is not frost-hardy and it prefers a warm sunny climate, although this is not essential. In warmish climates, it will survive the winter, underground, and grow up again in the spring as a perennial. In very cold climates you can get a crop by sowing in peat pots indoors and planting out after the last frost. The pole bean needs plenty of moisture at its roots, and its flowers will not set without an occasional shower of rain, or spray from a hose. It will grow in most soils but likes rich ones; it benefits from plenty of humus and plenty of moisture. And it does not like acid soils. 6.5 pH is ideal, so lime if necessary.

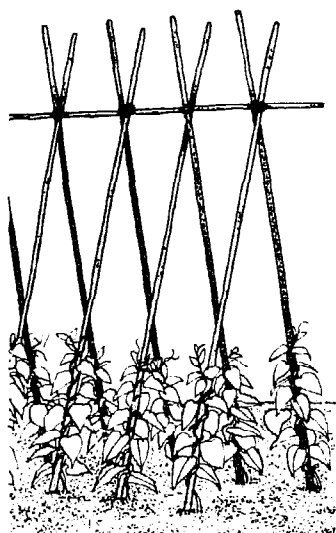
Soil treatment

The classic method is to take out a deep trench in the fall or winter and fill it with manure or compost, or else spend the winter filling it with kitchen garbage and anything else organic you can find. In the spring cover the trench with soil and plant on that. The compost, or whatever it was, will have subsided as it rotted and so there will be a shallow depression for the water to collect and sink into, and beans like plenty of water. If you don't dig a trench, you must still dig deeply and put in plenty of compost.

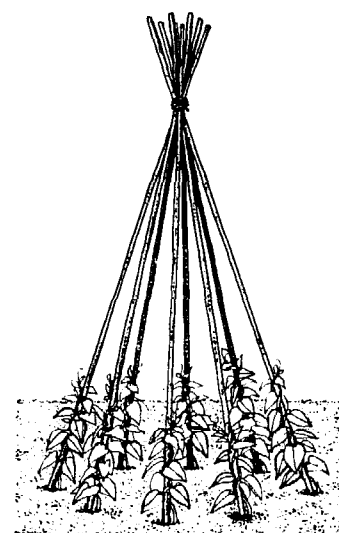
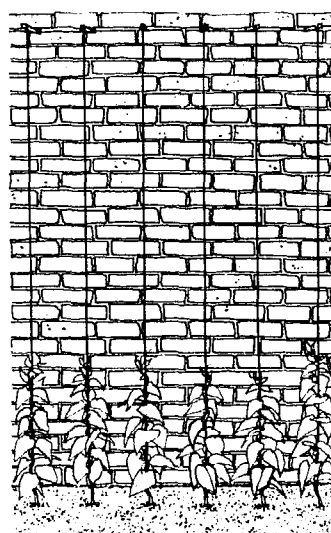


SOWING POLE BEANS

To get as many plants as possible into the space available, sow seeds three inches (8 cm) deep, ten inches (25 cm) apart in two rows one foot (30 cm) apart. Stagger the seeds in the rows. You can speed germination by soaking the seed in water before planting, although you should not do this if you suspect halo blight.

**STAKING POLE BEANS**

Each pole bean plant must have its own stake, anywhere between seven feet (2 m) and 12 feet (3.5 m) high. With two rows, you can use the crossed pole method, where pairs of poles are tied together to form forks near their tops and the whole row is made secure with a pole laid through the forks and tied down. If you want your beans against a wall fix wires close to the wall by attaching them to long nails top and bottom. The wiggam method is excellent, even in a tub or large barrel. Sow eight to twelve seeds in a circle; when the plants come up give them each a pole and tie them all together near their tops.

**Propagation**

If you want early pole beans sow in peat pots in the greenhouse, or in a sunny window, during late spring. A temperature of about 55°F (13°C) is fine. Most people just sow them out of doors after the last frost. I draw two drills a foot (30 cm) apart and sow the seeds three inches (8 cm) deep, ten inches (25 cm) apart in the rows and staggered. If you use the deep bed method (see p. 106), you must still plant in a row so that all your plants receive plenty of light. Therefore plant no closer.

Care while growing

Weed them of course, water them in dry weather, and before they are many inches high stake them with stakes at least seven feet (2 m) high. They will climb as high as 12 feet (3.5 m) if you give them long enough stakes, and personally I like them tall. The more beans the better, and you can always stand on a box to pick them. Put in stakes when two true leaves are well opened. There are several methods of training pole beans. As long as you have plenty of space – enough for two rows of plants – you can use bamboo or bean sticks (like pea sticks, only longer) to build a row of crossed poles, with their apexes in between the rows. Tie them together where they meet and strengthen by tying canes along the top. If you are short of space you can plant your beans in a circle and build a wigwam of poles around the circle. (This is better in my opinion than using dwarf varieties in a small space.) Another method is to plant the seeds along the bottom of a wall and train the plants up wires against the wall. I love to see a really high screen of beautiful pole beans, sited so as not to shade anything that must have sun (plenty of plants, like lettuces, grow well in shade) and screening some ugly feature in the garden.

If the flowers are out in a dry period spray them lightly with water – preferably water which is not too cold. This helps the flowers to set.

Pests and diseases

With good organic soil you are unlikely to get trouble, but you might just have one of the four varieties below.

Bean disease This is a fungal disease which causes black spots to appear on the pods of pole and bush beans; later on the spots develop reddish outlines. At the first sign of this disease spray with Bordeaux mixture, but if the disease gets

a strong hold, root out the affected plants and burn them. Never save seed if you have had an attack of bean disease.

Halo blight Caused by bacteria, this results in semi-transparent spots surrounded by a yellow halo on leaves. Spray with Bordeaux mixture. Do not save seed for next year, and if you have any doubt about your seed do not soak it before planting.

Mosaic disease This shows itself as yellow blotches on the leaves. It lives in clover, so do not plant pole or bush beans in soil where old clover has been dug in. If you do get it, pull up the plant and burn it.

Mexican bean beetle This is a brown spotted beetle a little bigger than a ladybug. If your beans are prone to attack, you will find they will attack your main crop more than your early crop. So put in your main crop as early as you can. Pick off and kill any beetles you see, and rub out the yellow larvae on the undersides of leaves. Dusting with rotenone is effective.

Harvesting and storing

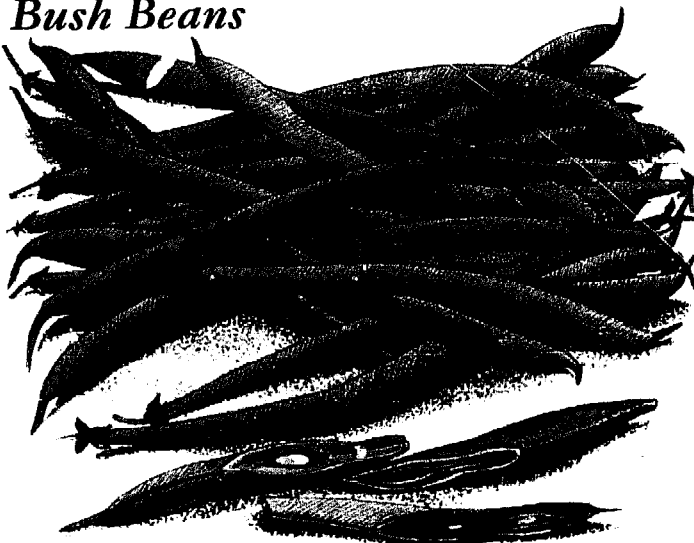
Pick pole beans, like peas, with both hands. Hold the vine in one hand and pull the pod with the other. Harvest on the "pick and pick again" principle. Keep on picking them when they are young and tender, and don't allow them to get old and haggard on the vine. If you keep picking they will keep coming – they are the most generous of crops.

If you can't eat them all salt them (see p. 215). But remember, salt them only when they are young and tender.

**PICKING POLE BEANS**

Pick beans and peas with two hands. If you pick with one hand you can do lasting damage to the vine. Pick them while they are young, and you will be encouraging more to grow. Don't ever leave them to get old on the vine: if there are too many for you to eat all at once, salt them. Frozen pole beans don't taste as good as salted ones.

Bush Beans



Bush beans are nothing like so hardy as broad beans. When fully ripened and dried, they form a rich source of winter protein.

Soil and climate

Plant when the soil has warmed up in the summer. They prefer a lightish soil or a soil well-improved by compost, and a pH of about 6.5

Soil treatment

Don't lime for them if your soil is not too acid. The more humus you can incorporate when digging the soil the better.

Propagation

When sowing in drills have the rows two feet (60 cm) apart and sow two inches (5 cm) apart in the drills - deep bed method four to six inches (10-15 cm) apart (see p. 106). Modern bush beans mature so rapidly that you can plant repeat crops throughout the summer.

Care while growing

Keep the bed well weeded and the soil loose.

Pests and diseases

Cut worm Cut worms are rarely troublesome, but can be kept away by placing a three inch (8 cm) cardboard collar around the stem of the plants (see p. 124). Bend the cardboard so that it is half an inch (1 cm) from the stem all round. Allow one inch (2.5 cm) below ground and two inches (5 cm) above. Alternatively place a ring of wood ash around each plant.

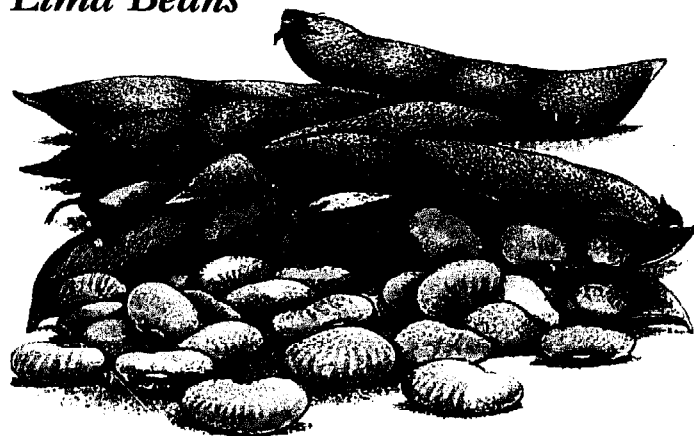
Wireworm If you are troubled by wireworms try to trap them during the winter by burying cut pieces of potato six inches (15 cm) deep at intervals of about a yard. Mark them with sticks, carefully dig them up each evening and destroy the wireworms which you will find there.

Mexican bean beetle See Pole beans.

Harvesting and storing

Like all beans, bush beans are grown for two purposes: for the green pods with immature beans inside and for the ripened beans which can be dried. To dry beans you just let them ripen, hang the vines upside-down in a shed, and thresh them when you want them. To harvest pick the beans by hand. They can be stored green in salt.

Lima Beans



These are beans from tropical America which have been bred for growth in warmish temperate climates. They can be cooked and eaten when green, or dried for winter storage. There are bush and climbing varieties.

Soil and climate

Unless they are started off under glass, they need three months of fairly warm days and nights. The seed needs warm soil to germinate, so don't plant until two or three weeks after the last frost. And bear in mind that the first autumn frost will cut them down. If you have this sort of climate, they are worth growing because they are very heavy cropping. Limas like lightish soil but will grow in any soil except heavy clay. Untypically for beans they prefer a slightly acid soil; a pH of 6 is about right.

Soil treatment

Limas should follow a well manured crop such as potatoes or celery. Simply dig the soil fairly deeply and, if you can spare it, mulch with compost.

Propagation

Sow the seed about six to eight inches (15-20 cm) apart for bush varieties and eight inches (20 cm) apart for climbers. The former should be in rows 24 inches (75 cm) apart; the latter should be in one row. For the deep bed method (see p. 106) allow one foot (30 cm) between bushes, six inches (15 cm) between climbers which should still be planted in one row. In colder regions plant indoors in peat or paper pots and plant out in warm weather.

Care while growing

Mulching is very valuable, and the beans must also be kept well watered.

Pests and diseases

Downy mildew This is often a serious problem in damp weather. To control it destroy diseased plants after harvest and rotate plantings at wide intervals.

Harvesting and storing

For eating green, harvest on the "pick and pick again" principle, once the beans are swelling in the pod. Don't pick them too late because, like pole beans, they get tough. If you want to dry them, leave the pods on the plant until the plants are dry. Pick the beans by hand, or thresh by walking on the plants.

Soybeans



You can eat soybeans green in the pods, shell them or dry them. They are very high in protein. The beans can be crushed for their oil and the flour which is left can be added to the flour of cereals to make a high protein bread.

Soil and climate

Soybeans grow well only where it is warm. They don't mind slightly acid soils, like high organic matter, and will grow in quite moist conditions.

Soil treatment

Soil with plenty of humus in it just needs a light forking. Otherwise dig thoroughly and lime for a pH of 6.5.

Propagation

Sow them outdoors in early summer; a good rule is to sow when the apple trees are in full bloom. Sow an inch (2.5 cm) deep and three inches (8 cm) apart in the rows — deep bed method (see p. 106) four inches (10 cm) apart. Where the beans have not been grown before, the seed should be inoculated with nitrogen-fixing bacteria, because it is likely that the right bacteria do not exist in the soil.

INOCULATING SOYBEAN SEED

Where soybeans have not been grown before, the soil may not contain the right nitrogen-fixing bacteria. Prepare seeds by stirring them up with water in a bowl. Add nitrogen-fixing bacteria to the water-coated seeds, making sure each seed is thoroughly covered with the bacteria. Careful inoculation will increase your yield by up to a third — and improve your soil into the bargain.



Care while growing

Hand weed rigorously, and mulch with compost if you can.

Pests and diseases

Soybeans are very hardy but they can suffer from various fungus diseases (see Pole beans). These can be prevented by proper crop rotation.

Harvesting and storing

Pick soybeans green and eat them whole, or wait for them to ripen, in which case steam or boil the pods for a few minutes before shelling them. Otherwise pull the plants and hang them up to dry.

Peanuts



Peanuts, or ground nuts or monkey nuts, are very rich in the vitamins A, B and E. They grow extensively in the southern states but can only be grown in the colder northern states with glass protection at each end of their season. As they are quite cheap to buy and as there are so many other things we really need our glass for they are hardly worth growing in cool climates.

Soil and climate

Peanuts need a warm growing season of over four months; five is ideal. They like sandy soil and, unlike most legumes, they like an acid soil: pH of 5 is about right.

Soil treatment

Dig deeply and incorporate plenty of compost. Never lime for peanuts.

Propagation

You can plant peanuts, shells and all, or shell them and plant the nuts. Plant shells eight inches (20 cm) apart, nuts four inches (10 cm) apart. For the deep bed method (see p. 106) allow four inches (10 cm) and three inches (8 cm) respectively. In warm climates plant four inches (10 cm) deep, but in cool climates make it only one and a half inches (4 cm). To give them the longest possible growing season in cool climates they should be planted at about the time of the last probable frost. You may need to start them off under glass, if you live in a very cold place. Sow them in rows 30 inches (75 cm) apart.

Care while growing

The yellow flowers are the staminate ones; the productive pistillate flowers are inconspicuous, and after being fertilized they bury themselves in the ground and develop into peanuts. Raise the soil in a circle around the plant so that the fruits forming at the ends of their stems can easily bury themselves. Peanuts will only ripen below ground.

Pests and diseases

Peanuts are hardy and rarely suffer from pests or diseases.

Harvesting and storing

In a warm climate pull the vines when the leaves go yellow and hang them in a dry airy place. In more temperate climates leave them until after the first frosts — the nuts will continue to ripen underground even after the leaves have frosted away. Before eating them roast your peanuts in their shells for 20 minutes in a 300°F (150°C) oven and leave them to cool — a vital part of the peanut roasting process.